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SPORT FISHERY ABSTRACTS

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U. S. FISH AND WILDLIFE SERVICE

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March 3, 1849

SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 22 Number 4 1977

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AQUATIC PLANTS AND THEIR CONTROL

77-001880 Kirby, G. F.; Shell, E. W. KARMEX HERBICIDE WITH FERTILIZATION AND AERATION TO CONTROL FILAMENTOUS ALGAE IN HATCHERY PONDS. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 29: 279-281. 1975[1976]. SFA 22(4)

[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] Six 0.10-acre (0.04 ha) hatchery ponds containing striped bass fingerlings were treated with Karmex herbicide in an effort to control filamentous algae composed mainly of the genera /Pithophora/ and /Spirogyra/. Ponds treated were fertilized and aerated immediately after application of Karmex. Shortly after treatment with Karmex, large mats of filamentous algae floated to the surface, decayed, and were broken into fragments by agitation from aerators. The fragments settled to the pond bottoms. Dissolved oxygen concentration dropped rapidly for several days following treatment, but remained above critical levels and then increased slowly. After 11 to 13 days dissolved oxygen concentrations at sunrise were above 8.0 mg/l and aeration was discontinued. Dense phytoplankton blooms, believed to be a result of both fertilization and release of nutrients tied up in the filamentous algae, developed 13 to 17 days after treatment with Karmex, and prevented new growths of filamentous algae. Draining of ponds 44 to 97 days after treatment revealed no significant growths of filamentous algae.

GENERAL FISH CULTURE

77-001881 Avault, J. W., Jr. , (ed.) PROCEEDINGS OF THE SEVENTH ANNUAL MEETING WORLD MARICULTURE SOCIETY. La. State Univ., Baton Rouge 729p. 1976. SFA 22(4)

A collection of over 40 papers on fish and shellfish culture presented at the January 25-29, 1976 meeting in San Diego, CA.--RS

77-001882 Easley, J. E., Jr. RESPONSE OF COSTS AND RETURNS TO ALTERNATIVE FEED PRICES AND CONVERSIONS IN AQUACULTURE SYSTEMS. Mar. Fish. Rev. 39 (5): 15-17. May 1977. SFA 22(4)

[Dep. Econ. Business, N. Car. State Univ., P.O. Box 5576, Raleigh 27607]

77-001883 Edwardson, W. ENERGY DEMANDS OF AQUACULTURE--A WORLDWIDE SURVEY. Fish Farming Int. 3 (4): 10-13. Dec. 1976. SFA 22(4)
[Energy Anal. Unit, Univ. Strathchyde, Glasglow, Scotland]

77-001884 FAO of the UN WORKSHOP ON CONTROLLED REPRODUCTION OF CULTIVATED FISHES. REPORT AND RELEVANT PAPERS. REUNION SUR LA REPRODUCTION CONTROLEE DES POISSONS D'ELEVAGE. RAPPORT ET COMMUNICATIONS APPARENTEES. EIFAC Tech. Pap. No. 25. 180p. 1975. In English and French. SFA 22(4)
[Rome, Italy]

77-001885 Gerking, S. D. FRESHWATER FISH--A GLOBAL FOOD POTENTIAL. Ambio 6 (1): 39-43. 1977. SFA 22(4)
[Zool. Dep., Ariz. State Univ., Tempe 85281]

77-001886 Glude, J. B. THE ROLE OF FEDERAL AGENCIES IN AQUACULTURE. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 33-47. 1976. SFA 22(4)
[NOAA, 2703 W. McGraw St., Seattle, WA 98199]

77-001887 Lanier, J. A.; Collines, E. V. THE NATIONAL AQUACULTURE INFORMATION SYSTEM (NAIS). IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 63-67. 1976. SFA 22(4)
[Va. Inst. Mar. Sci., Gloucester Point 23062]

77-001888 Muench, K. A. THE ROLE OF THE ELECTRIC UTILITIES INDUSTRY IN DEVELOPING THE USE OF THERMAL EFFLUENT IN AQUACULTURE. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 535-541. 1976. SFA 22(4)
[Res. Develop. Prog., South. Calif. Edison Co., P.O. Box 800, Rosemead 91770] Economic and operating returns from utilization of waste heat in thermal effluent would be important benefits to the electric utilities industry and could contribute toward easing the burden on our energy resources. Aquaculture at power plant sites is one means of achieving these benefits. Waste heat can be used to accelerate the growth rates of marketable marine animals, and thereby reduce production time and costs. Several large public utilities have recognized the potential benefits of thermal effluent for aquaculture to such an extent that they are supporting laboratory, pilot, and commercial-scale operations. One such project, sponsored by the Southern California Edison Company, is described. Criteria for selection of pilot and commercial-scale aquaculture sites at generating stations, such as high temperature changes and stable effluent temperatures, water quality, and adequate space, are considered. Research is underway on the biology and culturing requirements of the American lobster (/Homarus americanus/) with thermal effluent as a culturing medium. Several problems remain to be solved and are under investigation. These include brood stock management, nutrition, and the development and evaluation of culture systems suitable for commercial production. Pilot-scale lobster aquaculture will depend on the results of this work. The pilot plant itself will be employed as a researsch tool, the last phase of a program to demonstrate a successful aquaculture technology involving use of thermal effluent.

77-001889 Persoone, G. PROGRESS REPORT--THE POSSIBLE FOUNDATION OF A EUROPEAN MARICULTURE SOCIETY (EMS) AFFILIATE OF THE WORLD MARICULTURE SOCIETY (WMS). IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 49-62. 1976. SFA 22(4)
[Lab. Biol. Onderz. Milieuverontreiniging B 9000 Ghent, Belgium]

TROUT AND SALMON CULTURE

77-001890 Aldridge, C. H. HATCHERIES HELP SAVE NEW BRUNSWICK SALMON FISHERIES. Fish Farming Int. 3 (3): 8-11. Sept. 1976. SFA 22(4)
[Univ. New Brunswick, Fredericton, NB, Canada]

77-001891 Edwards, D. J. TEN YEAR STRUGGLE TO SUCCESS--A REPORT ON EUROPE'S LEADING SALMON FARMING VENTURE. Fish Farming Int. 3 (4): 16-20. Dec. 1976. SFA 22(4)
[Dep. Anim. Genet. Breeding, Agric Univ. norway, Norway]

77-001892 Edwards, D. J. TWO SALMON STATIONS IN WESTERN NORWAY LINK RESEARCH TO COMMERCIAL FARMING. Fish Farming Int. 3 (2): 4-8. June 1976. SFA 22(4)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, Norway]

77-001893 Kaeriyama, M.; Kobayashi, A. [STUDIES ON THE EFFECTIVE PROMOTION OF ARTIFICIAL SALMON PRODUCTION IN THE TOKACHI RIVER SYSTEM--I. UTILITY AND SURROUNDING CONDITIONS IN THE CHUM SALMON PRODUCTION OF THE UTSUNAI HOLDING POND.] Sci. Rep. Hokkaido Salmon Hatchery No. 31: 37-53. 1977. In Japanese with English summ. SFA 22(4)
[Hokkaido Salmon Hatchery, Sapporo, Japan]

77-001894 Kaeriyama, M. [STUDIES ON THE EFFECTIVE PROMOTION OF ARTIFICIAL SALMON PRODUCTION IN THE TOKACHI RIVER SYSTEM--II. ESCAPEMENT AND CATCHING OR SPAWNING PROCEDURES OF THE CHUM SALMON IN THE TOKACHI RIVER SYSTEM DURING 1976.] Sci. Rep. Hokkaido Salmon Hatchery No. 31: 55-70. 1977. In Japanese with English summ. SFA 22(4)
[Hokkaido Salmon Hatchery, Sapporo, Japan]

77-001895 Landless, P. J.; Jackson, A. J. ACCLIMATISING YOUNG SALMON TO SEA WATER. Fish Farming Int. 3 (2): 15-17. June 1976. SFA 22(4)
[Dunstaffmage Mar. Lab., Oban, Scotland]

77-001896 McBride, J. R.; Fagerlund, U. H. M. SEX STEROIDS AS GROWTH PROMOTERS IN THE CULTIVATION OF JUVENILE COHO SALMON (/ONCORHYNCHUS KISUTCH/). IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 145-161. 1976. SFA 22(4)
[Fish. Mar. Serv., Vancouver Lab., 6640 N.W. Marine Dr., Vancouver, BC V6T 1X2, Canada] Studies were carried out to determine whether the anabolic steroids 17alpha-methyltestosterone, 11-ketotestosterone, 4-chlorotestosterone acetate, testosterone, oxymetholone and progesterone can promote an increase in body weight when incorporated, singly, in the diet of juvenile coho salmon (/Oncorhynchus kisutch/). The steroids were administered for total periods of 32 or 34 weeks at concentrations of 1 and 10 mg/kg of diet. Significant increases in

77-001896 CONTINUED
both body weight and length, at both concentrations, were recorded for 17alpha-methyltestosterone, 11-ketotestosterone, testosterone and oxymetholone. Progesterone and 4-chlorotestosterone acetate failed to induce any change. Effects of the steroids on external characteristics, muscle composition and on the histological structure of the gonads will be presented. Preliminary results from a pilot study carried out in a hatchery environment will be used to illustrate the potential for sex steroids as growth promoters in salmon cultivation.

77-001897 Milne, P. H. THE GROWTH OF FISH FARMING IN SCOTLAND. Fish Farming Int. 3 (4): 34-36. Dec. 1976. SFA 22(4)
[Univ. Strathclyde, Glasgow, Scotland]

77-001898 Moberly, S. A.; Lium, B. JAPAN SALMON HATCHERY REVIEW. Fisheries (Bull. Am. Fish. Soc.) 2 (3): 2-7. May-June 1977. SFA 22(4)
[Alaska Dep. Fish Game, Subport Bldg., Juneau 99801]

77-001899 Rychly, J.; Marina, B. A. THE AMMONIA EXCRETION OF TROUT DURING A 24-HOUR PERIOD. Aquaculture 11 (2): 173-178. June 1977. SFA 22(4)
[Dep. Anim. Physiol., Wilhelm-Pieck-Univ., Rostock, East Germany] Ammonia excretion of fed and starved rainbow trout was measured during a period of 24 h. Measurements were performed every 2 h. Fed fish excreted about four times as much as those which were starved for 12 days. Significant differences were noticed between highest and lowest 2-h values, indicating a possible circadian rhythm of ammonia excretion and nitrogen metabolism in fish.

77-001900 Tatum, W. M. COMPARATIVE GROWTH AND MORTALITY OF WINTER-CULTURED RAINBOW TROUT (/SALMO GAIRDNERI/) IN FRESHWATER AND BRACKISH WATER PONDS IN SOUTH ALABAMA. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 71-78. 1976. SFA 22(4)
[Ala. Mar. Resour. Div., Dep. Conserv. Nat. Resour., Gulf Shores 36542] Comparative experiments in brackish water and freshwater pond culture of rainbow trout (/Salmo gairdneri/) were conducted from November 1974 to March 1975 at Claude Peteet Mariculture Center, Gulf Shores, Alabama. The average weight gain for individual trout was greater in freshwater ponds than in brackish water ponds; however, overall production was less and mortality and food conversion higher. The conclusion is that brackish water provides a buffer to unseasonable warm weather; this buffer does not exist in freshwater ponds in south Alabama.

OTHER ANADROMOUS SPECIES CULTURE

77-001901 Bieniarz, K.; Epler, P. INVESTIGATIONS ON INDUCING SEXUAL MATURITY IN THE MALE EEL /ANGUILLA ANGUILLA/ L. J. Fish Biol. 10 (6): 555-559. June 1977. SFA 22(4)
[Inst. Appl. Zool., Acad. Agric., Krakow, Poland] Studies on inducing sexual maturity in European eel males have been made. The fish were kept in fresh or artificial sea water at a temperature of 20°C, and hormonal injections were given. Among the hormones used, the positive results were obtained with human chorionic gonadotropin. All the male eel injected with this hormone produced sperm containing

77-001901 CONTINUED
living spermatozoa. The quality of sperm of the males kept in fresh water was poorer in comparison with the sperm of the males kept in the artifical sea water.

77-001902 McIlwain, T. D. CLOSED CIRCULATING SYSTEM FOR STRIPED BASS PRODUCTION. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 523-534. 1976. SFA 22(4)

[P.O. Drawer AG, Ocean Springs, MS 39564] Production of striped bass, (/Morone saxatilis/), fingerlings for stocking into Mississippi coastal streams in support of Mississippi's striped bass restoration program has been a continuing goal of the Anadromous Fish Section of the Gulf Coast Research Laboratory since 1969. Hydrological conditions and land use restrictions necessitated the development of a closed culture system for production of striped bass fingerlings. The closed culture system was composed of two earthern ponds plumbed to twenty-five 3,900 liter circular tanks used for rearing. Pond No. 1 was stocked with water hyacinths (/Eichhornia crassipes/) and used as a biological filter and Pond No. 2 served as a water reservoir for the 25 raceways. Eight hundred and sixty-nine thousand, 24-hours old, striped bass sac-fry were stocked into the circular raceways at the rate of 8.9 fry per liter and 6,424 fish were harvested for a survival rate of 0.73 percent. Rearing fry to fingerlings took a mean of 60 days (55-63 days). At harvest the fish ranged in total length from 28 to 72 mm and averaged 45.1 mm with an average coefficient of condition of 1.02.

WARMWATER CULTURE

77-001903 Aston, R. J.; Brown, D. J. A.; Milner, A. G. P. HEATED WATER FARMS AT INLAND POWER STATIONS. Fish Farming Int. 3 (2): 41-44. June 1976. SFA 22(4)

[C.E.R.L. Freshwater Biol. Unit, Ratcliffe-on-Soar Power Stn., Nottingham, England]

77-001904 Calbert, H. E.; Huh, H. T. CULTURING YELLOW PERCH (/PERCA FLAVESCENS/) UNDER CONTROLLED ENVIRONMENTAL CONDITIONS FOR THE UPPER MIDWEST MARKET. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 137-144. 1976. SFA 22(4)

[Dep. Food Sci., Univ. Wis., Madison 53706] Yellow perch (/Perca flavescens/) are in great demand in the upper midwest around the Great Lakes area. The supply of this species from natural waters is declining rapidly while the demand is increasing. To supplement the natural supply a system of culture for this species under controlled environmental conditions has been developed at the University of Wisconsin-Madison. The fish are raised from fingerling to market size (150 g) in 9 to 11 months on a pelleted feed at water temperatures of 21 C and photoperiods of 16 hr. The water used in the system is cycled through biological filters so that it can be used approximately 20 times. Feed conversion is approximately 1.5. The fish have an excellent flavor and yeild approximately 5 percent more fillets than fish from natural waters.

77-001905 Coleman, R. INTENSIVE FISH CULTURE ON AN ISRAELI KIBBUTZ. Fish Farming Int. 3 (4): 6-8. Dec. 1976. SFA 22(4)
[Haifa Med. Sch., Haifa, Israel]

77-001906 Cremer, M. C. EEL CULTURE IN THE PHILIPPINES. IN A. W. Avault (ed.). Proc. Annu. Meet. World maricult. Soc. 7: 129-136. 1976. SFA 22(4)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] In 1973, a project to evaluate the feasibility of culturing native anguillid eels as an export product was undertaken by the Philippine Bureau of Fisheries. Species identification, distribution and relative abundance of elvers, and culture feasibility were studied. Three species of anguillid eels were identified in streams throughout the north coastal region of Luzon Island: /Anguilla marmorata/, /A. celebesensis/, and /A. bicolor pacifica/. Elvers of all three species migrated simultaneously. Only /A. bicolor pacifica/ appears suitable for commercial culture at present. Commercial quantities of elvers were found only in the Cagayan River. During 1973-1974, 2.2 metric tons of elvers were collected from this river. In culture experiments, elvers grew well on a ration of ground fish with vitamin additives and showed a 6:1 feed conversion. A pelleted feed appeared desirable for fingerling and larger eels (greater than 3g). Elvers succumbed to oxygen concentrations less than 2ppm; fingerling and larger eels were more tolerant of low dissolved oxygen. Mean water temperature of 25.3 C appeared suitable for year-round culture. Commercial culture operations were toured at the conclusion of the Bureau of Fisheries Project. Initial developments, problems and potentials were evaluated.

77-001907 Delmendo, M. N.; Gedney, R. H. LAGUNA DE BAY FISH PEN AQUACULTURE DEVELOPMENT--PHILIPPINES. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 257-265. 1976. SFA 22(4)
[Fish. Res. Off. (Aquacult.), FAO of the UN, Via delle Terme de Caracalla, 00100 Rome, Italy] Laguna de Bay, in the Philippines, has been the setting for what is believed to have been one of the largest and most rapid growth fish pen developments that has occurred worldwide. Laguna de Bay is one of the largest lakes in Southeast Asia and has an area of 900 km². Beginning with a pilot project in 1971 of 38 ha, the fish pen development expanded to 4800 ha by the end of 1973. The gross annual value of production in 1973 was 76.8 million pesos. The lake is highly productive and is rich in phytoplankton and benthic food sources. One of the most important features of the fish pen aquaculture is that the rearing of fish in pens is accomplished with the natural feeds available in the lake. The species reared in the fish pens is entirely /Chanos chanos/ (Forskal), a phytoplankton feeder. Fry are collected from fry grounds along coastal waters in various parts of the country, raised in nurseries to fingerling sizes and released for rearing in the fish pens. The lake fish pen aquaculture has been estimated to have a potential for expansion to 20,000 ha of the fish pens having an annual production value of 320 million pesos. Because the lake is just south and east of Greater Manila, with a population of more than 5 million, there is an almost unlimited market for the fish pen harvests. However, there are grave problems which must be resolved if the present production is to be maintained and the future potential realized. These include environmental control of the lake waters--particularly with respect to pollution control--management of the lake fishery and resolution of social and economic problems generated by the rapid pace of fish pen development.

77-001908 Dwivedi, S. N.; Somalingam, J. PROFITABLE CARP SEED PRODUCTION BECOMES A REALITY FOR INDIA. Fish Farming Int. 3 (4): 30-32. Dec. 1976. SFA 22(4)

77-001909 Fago, D. M. NORTHERN PIKE PRODUCTION IN MANAGED SPAWNING AND REARING MARSHES. Wis. Dep. Nat. Resour. Tech. Bull. No. 96. 30p. 1977. SFA 22(4)

[Wis. Dep. Nat. Resour., Route 4, Madison 53711] From 1969 through 1973, the 3.7-acre (1.5 hectare) Pleasant Lake Marsh was stocked each spring with adult northern pike (/Esox lucius/ Linnaeus) in an effort to determine the factors that influence the production of fingerlings from managed spawning and rearing marshes. In 1971 and 1972, the 18.5-acre (7.5 hectare) Pabst Marsh was also studied. The annual production from the Pleasant Lake Marsh varied from 324 to 3,243 fingerlings per acre (131 to 1,312 per hectare). The Pabst Marsh produced 681 and 1, 052 fish per acre (276 and 426 per hectare) during the two years it was studied. These fingerlings were produced from an average of 12.1 and 11.0 lbs/acre (13.6 and 12.3 kg/ha) of adult females and males, respectively. The average production for both marshes at the time of draining was 1,332 fingerlings per acre (539 per hectare) having an average length of 3.5 inches (88.9 mm), and a length range from 1.5 to 6.8 inches (38-173 mm). The pounds per acre of fingerlings produced varied from 2.2 to 16.4 (2.5 to 18.3 kg/ha) with a mean of 10.6 lbs/acre (11.9 kg/ha). Estimated survival from egg deposition until the time of draining varied from 0.15 to 2.69 percent with an average of 1.09 percent. Factors suspected of influencing the production of northern pike from managed marshes were studied. However, sufficient data for making quantitative predictions on the number of norhtern pike produced from these factors were not obtained. Nevertheless, it was observed that water temperature and dissolved oxygen during the draining of the marsh, cannibalism during the fingerling stage, and zooplankton composition during the fry stage were some of the most important factors influencing the production of northern pike. A Fortran computer program was developed to handle the analyses of all northern pike stomach, zooplankton, and benthic samples.

77-001910 Jalabert, B.; Breton, B.; Brzuska, E.; Fostier, A.; Wieniawski, J. A NEW TOOL FOR INDUCED SPAWNING: THE USE OF 17ALPHA-HYDROXY-20BETA-DIHYDROPROGESTERONE TO SPAWN CARP AT LOW TEMPERATURE. Aquaculture 10 (4): 353-364. Apr. 1977. SFA 22(4)

[I.N.R.A., Lab. Physiol. Poissons, 78350 Jouy-en-Josas, France] The efficiency of different hormonal treatments to induce ovulation of carp at low temperatures (13-15°C) was tested. "Priming" with a low dose (0.6 mg/kg) of carp pituitary extract was found necessary for a subsequent successful treatment with 17alpha-hydroxy-20beta-dihydroprogesterone (17alpha-20beta P) (2 mg/kg) 1 day later. The eggs produced by this method showed satisfactory fertilization (75-96 percent) and hatching success (70 percent). On the other hand, normal hypophysation (5.4 mg/kg) following priming resulted only in partial ovulation and oocyte resorption at this temperature. Priming was shown to increase the gonadotropin level in plasma from about 2 to 35 ng/ml and to induce germinal vesicle migration toward the periphery of oocytes. Neither 17alpha-20beta P nor desoxycorticosterone alone or in association gave any positive result in the absence of a preliminary priming.

77-001911 Parker, N. C.; Strawn, K. /AUFWUCHS/ AND SEDIMENT FOULDING RATES IN FLOW-THROUGH AQUARIA RECEIVING A HEATED EFFLUENT FROM UPPER GALVESTON BAY, TEXAS. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 543-559. 1976. SFA 22(4)

[Dep. Wildl. Fish. Sci., Texas A&M Univ., College Station 77843] Development rates of the /Aufwuchs/ community on glass slides, plastic and asbestos plates, and sedimentation rates were determined in flow-through aquaria located in a greenhouse. These aquaria, used to culture selected marine and estuarine organisms, were provided with thermally regulated water (either 20, 25, 30, 35 C or ambient) taken from the discharge canal of a power plant on upper Galveston Bay, Texas. /Aufwuchs/ accrual was influenced by temperature, salinity, and species cultured. Sedimentation rates due to the supplemental feeding of organisms and sloughing from the /Aufwuchs/ community were as great as 7 ml/liter per day. Biological fouling and accumulation of sediments limit growth and production of intensively cultured organisms by lowering dissolved oxygen levels and producing anaerobic substrates. Organisms which feed by grazing can be effectively used to minimize substrate fouling in mariculture operations.

77-001912 Rappaport, U.; Sarig, S.; Bejerano, Y. OBSERVATIONS ON THE USE OF ORGANIC FERTILIZERS IN INTENSIVE FISH FARMING AT THE GINOSAR STATION IN 1976. Bamidgeh 29 (2): 57-70. June 1977. SFA 22(4)

[Fish. Dep., Ginosar, Israel] Observations were carried out on the effect of addition of various organic fertilizers in increasing yield, lowering FCR and cost of production of carp and tilapia under intensive monoculture growth conditions. Chicken droppings, liquid cattle manure, corral manure and chemical fertilizer were used in these tests. The results show that addition of fertilizer is largely effective during the summer months, less so in the fall and of no effect in the spring when the ponds will contain ample supplies of natural feed. The best results were obtained by use of a solution of chicken droppings which increased the yield by about 24 percent in comparision to the control, decreased the FCR by 0.8 units and lowered feed and fertilizer cost per kg fish by 52 percent. Corral manure produced poor and negative results, reducing the yield by 3 percent. During the forthcoming year, it would be worthwhile to follow up various methods of fertilization using chicken droppings and compare the effect of dried chicken droppings with that of the same fertilizer in solution and also test the importance of frequency of application during the week. Because of the great ease of chemical fertilization and possible scarcity of chicken droppings in the future, there should be continued testing of other methods of fertilization using chemical fertilizers such as application in liquid form and more frequent use.--Summ.

77-001913 Shang, Y. C. INDONESIAN MILKFISH FARMING--AN ECONOMIC EVALUATION. Fish Farming Int. 3 (4): 42-44. Dec. 1976. SFA 22(4)

[Hawaii Inst. Mar. Biol., Univ. Hawaii, Honolulu 96822]

77-001914 Sugimoto, Y.; Takeuchi, Y.; Yamaucki, K.; Takahashi, H. [INDUCED MATURATION OF FEMALE JAPANESE EELS (/ANGUILLA JAPONICA/) BY ADMINISTRATION OF SALMON PITUITARIES, WITH NOTES ON CHANGES OF OIL DROPLETS IN EGGS OF MATURED EELS.] Bull. Fac. Fish. Hokkaido Univ. 27 (3-4): 107-120. Dec. 1976. In Japanese with English summ. SFA 22(4)

[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

MARICULTURE

77-001915 Chan, K. K. EFFECT OF SYNTHETIC LUTEINIZING HORMONE-RELEASING HORMONE (LH-RH) ON OVARIAN DEVELOPMENT IN JAPANESE MEDAKA, /ORYZIAS LATIPES/. Can. J. Zool. 55 (1): 155-160. Jan. 1977. In English with French summ. SFA 22(4)

[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada] Regressed female medakas were injected with synthetic luteinizing hormone-releasing hormone (LH-RH) intraperitoneally twice a week for 6 weeks under warm temperature (23 ± 1°C) and short photoperiod (8 h light: 16 h dark). A dose response was observed as shown by the gonadosomatic index and the percentage distribution of class III oocytes with yolk formation. Ovulation also occurred in fish injected with the highest dose. Pituitary cytology revealed stimulation of gonadotropic cells in the proximal pars distalis by synthetic LH-RH at doses of 100 and 1000 ng per gram body weight. Thus, synthetic LH-RH seems to be effective in inducing ovarian development in the medaka. In fish, the presence of a system similar to the mammalian LH-RH system seems likely.

77-001916 Colura, R. L.; Hysmith, B. T.; Stevens, R. E. FINGERLING PRODUCTION OF STRIPED BASS (/MORONE SAXATILIS/), SPOTTED SEATROUT (/CYNOSCION NEBULOSUS/), AND RED DRUM (/SCIAENOPS OCELLATA/), IN SALTWATER PONDS. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 79-92. 1976. SFA 22(4)

[Texas Parks Wildl. Dep., Mar. Fish. Res. Stn., P.O. Box 1050, Palacios 77465] Striped bass (/Morone saxatilis/) production in two ponds (0.5 ha) at the Marine Fisheries Research Station, Palacios, Texas, during 1975 totalled 55,645 fingerlings (11,290/ha) averaging 41 mm in TL. Overall survival was 55.6 percent. Thirty thousand 7-day-old fry stocked in 0.1 ha pond produced 5,245 fingerlings (52,450/ha) in 40 days or 0.75 kg/ha/day. Survival was 17 percent. Seventy thousand 6-day-old fry stocked in a 0.4 ha pond produced 50,400 fingerlings (126,000/ha) in 45 days or 1.68 kg/ha/day. Survival was 72 percent. Spotted seatrout (/Cynoscion nebulosus/) production in nine ponds (1.23 ha) during 1975 totalled 6,230 fingerlings (5,065/ha) averaging 48.7 mm TL. Production ranged from 0.00 to 0.89 kg/ha/day. Overall survival was 3 percent ranging from 0. to 18.6 percent. Copepods comprised 55.6 percent of the diet of spotted seatrout less than 25 mm TL. Spotted seatrout 25 mm TL or greater fed primarily on polycheates (40.5 percent) and secondarily on palemonid shrimp (34.2 percent). Red drum (/Sciaenops ocellata/) production in 10 ponds (4.8 ha) during 1975 totalled 295,119 fingerlings (61,483/ha) averaging 39.6 mm TL. Production ranged from 0.13 to 2.17 kg/ha/day. Overall survival was 20 percent ranging from 1.9 to 65.0 percent. Red drum less than 25 mm TL fed almost exclusively on copepods (97.3 percent). Copepods (50 percent) and aquatic insects (45.4 percent) were the primary and secondary food items of red drum 25 mm TL or greater.

77-001917 Holt, R. S.; Strawn, K. THE CULTURE OF BLACK DRUM (/POGONIAS CROMIS/) IN CAGES RECEIVING EFFLUENT FROM A POWER PLANT. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 109-127. 1976. SFA 22(4)

[Dep. Wildl. Fish. Sci., Texas A&M Univ., College Station 77843] Black drum (/Pogonias cromis/) were cultured from 17 June 1974, until 15 May 1975, in 0.16 m³ cylindrical cages in the plant intake water and in heated effluent at stations 1, 2, and 3 located increasing distances from the inlet of the once-through 1053 ha cooling lake of an upper Galveston Bay electric generating station. All caged drum

77-001917 CONTINUED
died at the intake station by 12 November, while survival during summer and fall (17 June-19 November, 155 days) was 97 percent or higher at all stations in the cooling lake. Survival during winter and spring was poor with complete mortality occurring by 11 January, 9 May and 15 May at stations 1, 2, and 3, respectively. Deaths were associated with periods of poor water quality due to heavy rainfall and resultant low salinities. Intake water was the most variable in salinity while changes were less extreme and not as sudden as the effluent moved through the lake resulting in greater survival of fish at more distance stations. During summer and fall greatest mean daily length and weight gains, recorded at station 3, were 0.60 mm/day and 0.98 g/day, respectively. Food conversion values ranged from 3.56 for drum in a cage at station 3 to 48.44 for a cage of drum at the intake. During the winter and spring (20 November-15 May, 177 days) growth continued, but mean daily length and weight gains were very small (0.07 mm/day and 0.17 g/day--station 3). The length-weight relationship and standard length-total length conversion equations for drum cultured in cages are: $\log W = -9.861 + 2.868 (\log SL)$ and $TL = 3.426 + 1.236 (SL)$.

77-001918 Powell, M. R. TWO YEARS OF BRACKISH WATER CULTURE OF STRIPED BASS (/MORONE SAXATILIS/) IN SOUTH ALABAMA. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 93-97. 1976. SFA 22(4)
[Ala. Mar. Resour. Div., Dep. Conserv. Nat. Resour., Gulf Shores 36542] A total of 615,789, 2.5-5.0 cm striped bass (/Morone saxatilis/) fingerlings was produced in brackish water ponds at the Alabama Marine Resources Divisions' Claude Peteet Mariculture Center during the 1974-1975 striped bass production seasons. Due primarily to change in culture technique, production in 1975 was increased almost five-fold over 1974 production. During the 1975 season, average percentage survival among fry from thirty, 0.081 ha ponds was 32.3 percent, producing an average of 199,977 fingerlings per ha with an average gain of 1.8 kg per ha per day. The fish remained in the ponds an average of 33 days. Fifty thousand 7-day old striped bass fry stocked into a 0.081 ha pond containing marine predators survived at a rate of 2.7 percent over a 46-day period. Differences in survival during pond culture of fry from different female brood fish were observed.

77-001919 Roberts, D. E., Jr.; Harpster, B. V.; Havens, W. K.; Halscott, K. R. FACILITIES AND METHODOLOGY FOR THE CULTURE OF THE SOUTHERN SEA BASS (/CENTROPRISTIS MELANA/). IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 163-198. 1976. SFA 22(4)
[Fla. Dep. Nat. Resour., Mar. Res. Lab., 100 8th Ave. SE, St. Petersburg 33701] A closed system was designed for mass culture of marine finfish larvae. Southern sea bass (/Centropristis melana/) brood stock were collected in the Gulf of Mexico during January-March, 1975, their natural spawning season. Brood stock were maintained in a simulated spawning environment of 17-19 C temperature and 10 hr L:14 hr D photoperiod. Vitellogenesis of ovarian oocytes remained in the tertiary yolk globule stage in females held under these conditions and males would release milt freely upon manual stimulation. Final oocyte maturation and spawning were induced with Human Chorionic Gonadotropin and manual spawning techniques. Approximatley 2,500 larvae were reared in three trials using 2,000-liter silo tanks with biological filtration. Laboratory reared rotifers (/Brachionus plicatilis/) were solely used as food the first 4 days after feeding began. Wild plankton, rotifers, /Artemia/ nauplii, and prepared flake were also used as larvae developed. Greatest larval survival from hatching was 10.0 percent. Larvae grew from 2.78 mm to 9.0 mm in 24 days; the

77-001919 CONTINUED
greatest growth rate occurred after day 14. Physiological edema was observed in two trials affecting 30-50 percent of the larvae. Physiological edema appears to be the principal constraint to successful rearing of sea bass larvae.

77-001920 Valenti, R. J.; Aldred, J.; Liebell, J. EXPERIMENTAL MARINE CAGE CULTURE OF STRIPED BASS IN NORTHERN WATERS. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 99-108. 1976. SFA 22(4)
[N.Y. Ocean Sci. Lab., Dep. Ichthyol., Montauk 11954] Striped bass fingerlings of two sizes, 1.7 and 6.0g, were stocked in the fall of 1974 into floating cages placed in a sea water lagoon off of Shelter Island, New York. Duplicate stocking densities of 100, 200, 300 and 400 fish per $1.82m^3$ cage were established. Low water temperature (1.0 C) occurred in January and February 1975 and resulted in heavy mortality of the caged fish. In order to prevent the complete loss they were removed and overwintered in indoor pools from February until June at which time they were restocked in the floating cages at densities of 50 and 90 fish per cage. The mean growth rates by stocking densities indicated that fastest growth occurred with 100 fish per cage. Owing to mishaps which included escapes from the cages and mortalities, only 14 percent of the fingerlings stocked were harvestable as 0.25 and 0.5 Kg fish in the fall of 1975. The mean dress-out weight of these 280 fish was 81 percent. Relative food conversion values were between 1.4 and 1.8:1.

FEEDS, FEEDING AND NUTRITION

77-001921 Austreng, F.; Risa, S.; Edwards, D. J.; Hvidsten, H. CARBOHYDRATE IN RAINBOW TROUT DIETS. II. INFLUENCE OF CARBOHYDRATE LEVELS ON CHEMICAL COMPOSITION AND FEED UTILIZATION OF FISH FROM DIFFERENT FAMILIES. Aquaculture 11 (1): 39-50. May 1977. SFA 22(4)
[Dep. Poultry Fur Anim. Sci., Agric. Univ. Norway, 1432 As-NLH, As, Norway] Groups of rainbow trout fingerlings from ten different families were sampled after 12 and 24 weeks feeding on each of three diets which were similar in protein and energy content but had different percentages of metabolizable energy present as carbohydrate: 17, 25 and 38 percent. Fish fed different diets had the same dressed carcass weights, expressed as percentage of body weight, but fish fed higher carbohydrate diets had heavier livers and a higher percentage of discoloured livers. Chemical analyses of fish bodies showed lower fat and energy but higher protein and ash content for those fed higher carbohydrate diets. Livers contained more fat and carbohydrate but the same dry matter, and faeces showed less dry matter, more protein and the same energy content in fish with higher dietary carbohydrate. Utilization of dietary energy and protein was poorer in fish fed high levels of carbohydrate, but health of all fish appeared good. Little variation between different fish families, and no interaction between fish family and diet was found for any of the above parameters, indicating that prospects for change through selective breeding are poor.

77-001922 Dabrowska, H.; Wojno, T. STUDIES ON THE UTILIZATION BY RAINBOW TROUT (/SALMO GAIRDNERI/ RICH.) OF FEED MIXTURES CONTAINING SOYA BEAN MEAL AND AN ADDITION OF AMINO ACIDS. Aquaculture 10 (4): 297-310. Apr. 1977. SFA 22(4)

[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., Kortowo, Olsztyn, Poland] This paper deals with the growth of fish and utilization of feed mixtures in which fish meal is partly substituted by powdered soya beans. In order to improve the quality of protein in the feeds, they were enriched with synthetic amino acids. The food coefficients of the feeds were calculated, as were the protein efficiency ratio and apparent net protein utilization, by chemical analysis. The results of the experiment showed that an addition of amino acids improved the utilization of feeds. It was found that rainbow trout can utilize soya bean protein enriched with cystine (1 percent) and tryptophan (0.5 percent) almost as well as protein from the fish meal. Chemical composition of the experimental fish is discussed, as well as the amino acid composition of fish muscles and selected physiological parameters: haematocrit, haemoglobin content in the fish blood, the hepasomato index, and the content of protein, amino-transferases and cholesterol in the fish blood serum.

77-001923 Edwards, D. J.; Austreng, E.; Risa, S.; Gjedrem, T. CARBOHYDRATE IN RAINBOW TROUT DIETS. I. GROWTH OF FISH OF DIFFERENT FAMILIES FED DIETS CONTAINING DIFFERENT PROPORTIONS OF CARBOHYDRATE. Aquaculture 11 (1): 31-38. May 1977. SFA 22(4)

[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 AS-NLH, As, Norway] Groups of rainbow trout (/Salmo gairdneri/) fingerlings from ten different families were fed for 24 weeks on each of three diets similar in protein and energy content, but differing in the percentage of metabolizable energy present as carbohydrate. Fish growth was best on the diet with the lowest (17 percent), not quite as good on that with the intermediate (25 percent) and worst on the diet with the highest (38 percent) level of metabolizable energy from carbohydrate. Condition factors and food conversion efficiences were also poorer on higher carbohydrate diets. Highly significant differences were found between growth of different fish families fed the same diet, but no interaction between diet and family was found, indicating that the prospects for selectively breeding strains of rainbow trout specifically better able to utilize carbohydrate are not promising.

77-001924 Grayton, B. D.; Beamish, F. W. H. EFFECTS OF FEEDING FREQUENCY ON FOOD INTAKE, GROWTH AND BODY COMPOSITION OF RAINBOW TROUT (/SALMO GAIRDNERI/). Aquaculture 11 (2): 159-172. June 1977. SFA 22(4)

[James F. MacLaren, Ltd., 435 McNicoll Ave., Willowdale, ON M2H 2R8, Canada] The effects of feeding frequency on food intake, weight change and relative proportions of the major body components were investigated at 10°C in a strain of hatchery-reared rainbow trout. Feeding frequencies were from one meal every second day to six meals per day, within the range common to current piscicultural techniques. Fish were fed a dry, pelleted diet either to satiation at each meal, or in restricted total daily amounts based on a percentage of their wet body weight. All fish were forced to swim at a constant speed of approximately one body length per second to minimize variability in growth and body composition. Maximum daily food intake occurred with just two feedings to satiation per day. Growth closely paralleled food intake. Neither specific growth rate nor whole body levels of moisture, lipid or protein were affected significantly by differences in feeding frequency. A trend towards increased body fat with more frequent feeding was observed among fish fed to satiation at each meal; this was believed to be the result of a somewhat higher total

77-001924 CONTINUED
food intake than among less frequently fed fish. Fish fed a restricted daily ration divided into a number of meals exhibited smaller differences in lipid content. The general lack of response to feeding frequency was attributed primarily to the low metabolic rate of trout and to the characteristically slow rate of food passage in the digestive tract.

77-001925 Hearn, M. C. POST-STOCKING SURVIVAL OF LARGEMOUTH BASS REARED IN RACEWAYS ON AN ARTIFICIAL DIET. Prog. Fish-Cult. 39 (3): 126-127. July 1977. SFA 22(4)
[Ky. Dep. Fish. Wildl., Minor E. Clark Fish Hatchery, Morehead 40351]

77-001926 Lehmitz, R.; Spannhof, L. TRANSKETOLASEAKTIVITAET BEI THIAMINMANGEL IN DER NIERE VON REGENBOGENFORELLEN (/SALMO GAIRDNERI/) NACH KONTINUIERLICHER FUETTERUNG MIT ROGEM HERING. [TRANSKETOLASE ACTIVITY AND THIAMINE DEFICIENCY IN THE KIDNEY OF RAINBOW TROUT (/SALMO GAIRDNERI/) FED CRUDE HERRING.] Arch. Tierernaehr. 27 (4): 287-295. Apr. 1977. In German with English and Russian summ. SFA 22(4)
[Sekt. Biol. Wilhelm Pieck Univ., Rostock, West Germany] The feeding of crude, thiaminase-containing herring to rainbow trout produced external symptoms of thiamine deficiency after a period of 150 days. The level of transketolase activity in the kidney decreased continuously until the first appearance of deficiency symptoms, while the TPP effect showed an upward trend. After prolonged feeding of crude herring the decline of transketolase activity is accompanied by a deficiency of the apoenzyme of transketolase. The administration of thiamine-containing food to the thiamine-deficient animals induced an immediate increase in transketolase activity. Once the external deficiency symptoms are very pronounced the death of the animal can only, if at all, be prevented by an injection of thiamine.--Summ.

77-001927 Markert, J. R.; Higgs, D. A.; Dye, H. M.; MacQuarrie, D. W. INFLUENCE OF BOVINE GROWTH HORMONE ON GROWTH RATE, APPETITE, AND FOOD CONVERSION OF YEARLING COHO SALMON (/ONCORHYNCHUS KISUTCH/) FED TWO DIETS OF DIFFERENT COMPOSITION. Can. J. Zool. 55 (1): 74-83. Jan. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Vancouver Lab., West Vancouver, BC V7V 1N6, Canada] Paried groups of yearling coho salmon at 10°C and on a natural photoperiod were fed twice daily either Oregon moist pellets (OMP) or a diet with poultry offal (PO) as the main protein source. The fish were fed either 0.8 percent body weight per day (dry weight of food (g)/wet weight of fish (g)) or to satiation. Coho in one of the groups for each diet-ration combination received, by intramuscular injection, 10 ug (0.0092 IU) of bovine growth hormone (bGH) per gram body weight one time per week for 56 days. Those in the other group were not treated. Administration of bGH significantly enhanced growth and improved food and protein conversion. Ration level altered the effect of bGH on food and protein conversion as did diet formulation at satiation. The voluntary food intake of bGH-treated fish fed OMP was higher but not significantly different from that of the controls. Diet formulation differences did not significantly affect the growth rate of either bGH-treated or untreated coho at each ration level. Irrespective of the diet-ration combination, bGH administration led to a significant decline in condition factor. At 56 days, bGH-treated fish had a significantly lower percentage of muscle protein and a significantly higher percentage of muscle water than untreated fish. At present, the use of bGH as a growth promoter for coho salmon is not economical.

77-001928 Takeuchi, T.; Watanabe, T. [REQUIREMENT OF CARP FOR ESSENTIAL FATTY ACIDS.] Bull. Jpn. Soc. Sci. Fish. 43 (5): 541-551. May 1977. In Japanese with English summ. SFA 22(4)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

77-001929 Carmignani, G. M.; Bennett, J. P. RAPID START-UP OF A BIOLOGICAL FILTER IN A CLOSED AQUACULTURE SYSTEM. Aquaculture 11 (1): 85-88. May 1977. SFA 22(4)
[Aquacult. Sci. Div., Syntex Agribusiness, Inc., Palo Alto, CA 94304] Seeding of new biological filters with nitrifying bacteria is effective in reducing activation time of the new filters. In a series of tests, seeded filters were activated in an average of 10.7 days, compared with 22.2 days for the unseeded controls. The shorter activation period results from the reduced time required for the nitrifying organisms to increase in numbers to their environmental equilibrium in the system tested.

77-001930 Mighell, J. L. DEVICE FOR RAPID SEPARATION AND REMOVAL OF DEAD SALMON EGGS. Prog. Fish-Cult. 39 (3): 151-152. July 1977. SFA 22(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

77-001931 Mitchell, R. E.; Kirby, A. M., Jr. PERFORMANCE CHARACTERISTICS OF POND AERATION DEVICES. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 561-581. 1976. SFA 22(4)
[Aquaprawns, Inc., P.O. Box 1135, Marcus Hook, PA 19061] A study was made of the performance characteristics of various pond aeration devices in order to identify and effective system to use in the culture of /Macrobrachium rosenbergii/. Initial screening work was conducted in the laboratory and examined several porous sparger type devices and a jet exhauster system. Comparisons were made on the basis of the overall volumetric oxygen mass transfer coefficient, aeration efficiency and economy of operation. A sparger type aerator constructed using DuPont's Viaflo tubing was found to be the best candidate at this point. Work subsequently shifted to the pond site where the laboratory candidates were tested along with some larger mechanical aerators and several types of jet exhausters and eductors. Comparisons were made on the basis of the oxygen transfer capability, economy of operation, initial capital cost, and maintenance requirements. Six ponds, ranging in size from 0.03 ha to 0.17 ha, were in operation and stocked with prawns of various sizes from post-larvae to adults. A mechanical entrainment device called an Air-O-Lator turned out to be excellent from an oxygen transfer standpoint and would be a good choice for pond aeration except where water depth is less than 0.7 m. The sparger type aerators constructed of Viaflo tubing were the most economical to operate but encountered a maintenance problem due to algae growth. The exhauster and eductor type devices transfer large amounts of oxygen, but require a lot of energy to do so. Overall economics show the Air-O-Lator and Viaflo about equal in total cost with a slight advantage to the Air-O-Lator because of its superior maintenance record.

77-001932 Muir, J. F. HOW FILTERS IMPROVE WATER QUALITY FOR FISH FARMERS. Fish Farming Int. 3 (3): 35-38. Sept. 1976.
[Univ. Strathclyde, Glasgow, Scotland]

77-001933 Ribakoff, S.; Pelton, C. SOLID-STATE ENVIRONMENTAL CONTROLLER FOR AQUACULTURE SYSTEMS (SECAS). Prog. Fish-Cult. 39 (3): 109-111. July 1977. SFA 22(4)
[Oceanic Inst., Waimanalo, HI 96795]

77-001934 Seeger, P.; Thorsson, P.; Larsson, B.; Ronningen, K. ACCURACY AND PRECISION WHEN SAMPLING FROM FISH TROUGHS. Aquaculture 10 (4): 365-371. Apr. 1977. SFA 22(4)
[Div. Stat., Swedish Coll. Agric., Uppsala, Sweden] Salmon have been sampled repeatedly from seven troughs in order to evaluate the accuracy and precision of three different sampling methods. The average length of 2-summer-old salmon was determined to the nearest half centimetre after using a large scoop net which caught somewhat more than 200 fish per sweep. To avoid bias we had to use weighted means, with the weightings proportional to the square roots of the lengths. For 1-summer-old salmon we could use a smaller scoop net and unweighted means.

GENERAL LIMNOLOGY AND OCEANOGRAPHY

77-001935 Schroeder, M. H.; Norton, V. C.; Fronk, D. BIOLOGICAL COMPARISONS OF TWO SMALL STREAMS IN SAGEBRUSH RANGELANDS OF WYOMING. 1) PHYSICAL CONSIDERATIONS 2) THE ALGAL FLORA 3) THE INSECT FAUNA. J. Colo.-Wyo. Acad. Sci. 9 (1): 24. Apr. 1977. SFA 22(4)
Abstract only.

BENTHOS

77-001936 Canton, S. P.; Ward, J. V. AQUATIC MACROINVERTEBRATES OF TROUT CREEK, COLORADO. J. Colo.-Wyo. Acad. Sci. 9 (1): 7-8. Apr. 1977. SFA 22(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523]
Abstract only.

77-001937 Cutler, E. B. MARINE FLORA AND FAUNA OF THE NORTHEASTERN UNITED STATES. SIPUNCULA. NOAA Tech. Rep. NMFS Circ. 403. iii + 7p. July 1977. SFA 22(4)
[Utica Coll. Syracuse Univ., Utica, NY 13502] This report includes an account of the five species of Sipuncula living in shallow waters (down to 200 m) from Maine to Virginia. Four of these are widespread elsewhere in the world--/Golfingia eremita/, /G. margaritacea/, /G. minuta/, and /Phascolion strombi/. /Phascolopsis gouldi/ is endemic to the east coast of North America. An introduction to their biology, an annotated systematic list, selected bibliography, and an illustrated key are presented.

77-001938 Gray, L. J.; Ward, J. V. AQUATIC MACROINVERTEBRATES OF PICEANCE CREEK, COLORADO. J. Colo.-Wyo. Acad. Sci. 9 (1): 7. Apr. 1977. SFA 22(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] Abstract only.

77-001939 Healey, M. C. EXPERIMENTAL CROPPING OF LAKES: 4. BENTHIC COMMUNITIES. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 711. 22 + 48p. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada] This is the fourth in a series of limnological reports on Alexie, Baptiste, Chitty, and Drygeese lakes north of Yellowknife, NWT, and deals with the composition of the benthic community in the lakes. Benthic animals were identified to various taxonomic levels depending on difficulty of identification and importance in the fauna. Seventy-nine taxa were identified from the lakes, 43 percent of which were common to all lakes. Percent similarity calculations indicated greatest similarity between the pairs Alexie/Chitty and Baptiste/Drygeese. Chironomids, especially chironomini and tanytarsini, dominated in Alexie and Chitty, followed by sphaeriid molluscs and /Hyalella azteca/. Baptiste and Drygeese were dominated by /Pontoporeia affinis/ followed by chironomidae and /H. azteca/. There were few consistent seasonal trends in composition of benthos. Overall, benthos was slightly more abundant in 1972 than 1971. Benthic organisms were generally more abundant in these lakes than in other shield and shield margin lakes. Alexie and Drygeese had two clear peaks of abundance with depth, the first in shallow samples and the second at 20-25 m. Chitty had a single peak in abundance at mid depth. In Baptiste, benthos were most abundant in the shallowest and deepest samples and least abundant at intermediate depth. Dominant taxa generally had similar depth distributions, while the minor taxa were mainly in the shallow samples. The size composition of organisms was similar between lakes and years. Biomass distribution with depth was similar to numerical distribution. Organisms tended to be slightly larger in Alexie and Chitty. The data on benthic communities further confirm the similarity among the four lakes that was reported in previous reports, and that the greatest similarity was between Alexie and Chitty as a pair and Baptiste and Drygeese as a pair.

77-001940 Hocutt, C. H.; Dickson, K. L.; Masnik, M. T. METHODOLOGY DEVELOPED FOR SAMPLING MACROINVERTEBRATES BY ARTIFICIAL SUBSTRATES IN THE NEW RIVER, VIRGINIA. Rev. Biol. (Lisb.) 10 (1-4): 63-75. 1974-1976. SFA 22(4)
[Appalachian Environ. Lab., Univ. Md., Frostburg 21532] Macroinvertebrates were collected from the New River, Virginia on a seasonal basis, August 1971 through January 1973, using an artificial substrate sampler. Some 90 taxa were collected from all stations combined. Data indicated seasonal trends in numbers of taxa and specimens with the greatest abundance of each occurring in August 1972. The percentage of sampler recovery was usually high if New River discharges did not exceed 340-425 m^3/sec, but decreased with increased rate of flow.

77-001941 Lowery, R. S.; Mendes, A. J. /PROCAMBARUS CLARKII/ IN LAKE NAIVASHA, KENYA, AND ITS EFFECTS ON ESTABLISHED AND POTENTIAL FISHERIES. Aquaculture 11 (2): 111-121. June 1977. SFA 22(4)
[Dep. Biol., City London Polytech., London E1 7NT, England] /P. clarkii/ was introduced into Lake Naivasha in about 1970 since when it has multiplied and now forms an important organism in the eastern basin. It breeds throughout the year but with a distinct peak being obvious at such times as when the water level increases, which it does erratically. The increase in distribution and numbers from 1974-1976 is recorded; this will obviously continue as there are ample areas which it does not occupy at present. The density of population in the eastern basin is between one and three individuals of marketable size per square metre. The quality of tail meat was surveyed because of the fishery potential of the species. In some parts of the littoral region of the lake many animals were found to have atrophied muscles in the tail; it is suggested that this may in part be due to dietary deficiency. /P. clarkii/ has been introduced into the catchment areas of three major Kenyan rivers, including the Nzoia River draining to Lake Victoria. The implications of this for established gill net fisheries are discussed in the light of experience at Lake Naivasha where the species is a nuisance.

77-001942 Momot, W. T.; Gowing, H. RESPONSE OF THE CRAYFISH /ORCONECTES VIRILIS/ TO EXPLOITATION. J. Fish. Res. Board Can. 34 (8): 1212-1219. Aug. 1977. In English with French Summ. SFA 22(4)
[Dep. Biol., Lakehead Univ., Thunder Bay, ON P7B 5E1, Canada]

77-001943 Siegfried, C. A.; Knight, A. W. THE EFFECTS OF WASHOUT IN A SIERRA FOOTHILL STREAM. Am. Midl. Nat. 98 (1): 200-207. July 1977. SFA 22(4)
[Hydrobiol. Lab. Dep. Land Air Water Resour., Water Sci. Eng. Sect., Univ. Calif., Davis 95616] The benthic fauna of a single riffle of Squirrel Creek, California, was evaluated from May 1973 through April 1974. Annual autumn and winter storms cause Squirrel Creek discharge to fluctuate widely, leading to repeated washouts in the study riffle. The repeated washouts reduced benthic standing crop by more than 95 percent from October to January in the year of the study. Washout altered trophic relations and community structure within the macrobenthic community. This annual disruption of the benthic fauna may result in a less varied fauna than would otherwise exist. Recovery appears to be based on recruitment from newly hatched eggs and the availability of autochthonous energy sources.

77-001944 Stauffer, J. R.; Beiles, H. A.; Cox, J. W.; Dickson, K. L; Simonet, D. E. COLONIZATION OF MACROBENTHIC COMMUNITIES ON ARTIFICIAL SUBSTRATES. Rev. Biol. (Lisb.) 10 (1-4): 49-61. 1974-1976. SFA 22(4)
[Univ. Md., Cent. Environ. Estuarine Stud., Frostburg 21532] A series of 30 artificial substrates were anchored in the North Fork of the Roanoke River for 30 days to check the hypothesis that the colonization of artificial substrates for macrobenthos in a freshwater stream follows the MacArthur-Wilson Equilibrium equation as proposed for island faunas. Immigration rates and extinction rates followed the simple exponential as proposed by MacArthur-Wilson. Extinction rate equaled colonization rate on approximately day 22. Diversity indices decreased throughout the study period and suggested that the community stability on the artificial substrates was precluded by the lack of diverse habitats. Colonization of Diptera larvae increased with time, while colonization of Trichoptera, Plecoptera and Coleoptera reached a maximum on day 10. This sequence appeared to be affected by the

77-001944 CONTINUED
siltation of the Substrates through time.

PLANKTON

77-001945 Sameoto, D. D.; Jaroszynski, L. O.; Fraser, W. B. A MULTIPLE OPENING AND CLOSING PLANKTON SAMPLER BASED ON THE MOCNESS AND N.I.O. NETS. J. Fish. Res. Board Can. 34 (8): 1230-1235. Aug. 1977. In English with French Summ. SFA 22(4)

MORPHOLOGY

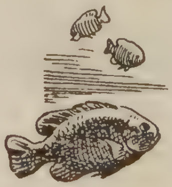
77-001946 Bortone, S. A. GONAD MORPHOLOGY OF THE HERMAPHRODITIC FISH /DIPLECTRUM PACIFICUM/ (SERRANIDAE). Copeia 1977 (3): 448-453. 25 Aug. 1977. SFA 22(4)
[Fac. Biol., Univ. West Fla., Pensacola 32504]

77-001947 Brown, D. S.; Copeland, D. E. OVERLAPPING PLATELETS: A DIFFUSION BARRIER IN A TELEOST SWIMBLADDER. Science 197 (4301): 383-384. 22 July 1977. SFA 22(4)
[Dep. Biol., Tulane Univ., New Orleans, LA 70118] Overlapping platelets are layered within the connective tissue of the wall of a closed (physoclistous) swimbladder. The close, staggered arrangement of the platelets is viewed as a physical barrier that can interfere with the diffusion pathway of gas molecules. The result is a more efficient retention of gas pressures within the swimbladder.

77-001948 Castle, P. H. J. LEPTOCEPHALUS OF THE MURAENESOCID EEL /GAVIALICEPS TAENIOLA/. Copeia 1977 (3): 488-492. 25 Aug. 1977. SFA 22(4)
[Dep. Zool., Victoria Univ. Wellington, Private Bag, Wellington, New Zealand]

77-001949 Craig, R. E.; Crossman, E. J. GENETIC VARIANTS IN CANADA OF THE RAINBOW TROUT, /SALMO GAIRDNERI/, CALLED GOLDEN TROUT AND PALOMINO TROUT. Can. Field-Nat. 91 (1): 93-94. Jan.-Mar. 1977. SFA 22(4)
[Ontario Minist. Nat. Resour., Midhurst, ON L0L 1X0, Canada]

77-001950 Garlov, P. E. ULTRASTRUCTURAL ORGANIZATION OF THE NEUROINTERMEDIATE COMPLEX OF THE HYPOPHYSIS OF /ONCORHYCHUS GORBUSCHA/ (WALBAUM). Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.) 231 (1-6): 534-537. May 1977. SFA 22(4)
[Biol. Res. Inst., A. A. Zhdanov Leningrad State Univ., Leningrad, USSR]



77-001951 Gaudant, M. OBSERVATIONS SUR L'ANATOMIE DES NAGEOIRES DORSALE ET ANALE DE CERTAINS POISSONS TELEOSTEENS. [OBSERVATIONS ON THE ANATOMY OF DORSAL AND ANAL FINS OF SOME TELEOSTEAN FISH.] C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat. 284 (24): 2479-2482. 27 June 1977. In French with English summ. SFA 22(4)
[Mus. Natl. Hist. Nat., Inst. Paleontol., 8, rue de Buffon, 75005, Paris, France] The study of dorsal and anal fin-rays articulation in Ctenothrissiformes, demonstrates that this structure differs from those known in Beryciformes and Pattersonichthyiformes and Myctophiformes. In fact, representatives of these last two orders, seem to suggest a trend towards differentiation of first rays in spines, fully realized in Beryciformes, and which remains undisclosed in Ctenothrissiformes.

77-001952 Gruber, S. H. THE VISUAL SYSTEM OF SHARKS: ADAPTATIONS AND CAPABILITY. Am. Zool. 17 (2): 453-469. 1977. SFA 22(4)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Miami, FL 33149] The visual system of elasmobranchs is reviewed with primary emphasis on recent investigations. Starting with the ocular adnexa and the whole eye and working through the cornea, uvea, Ciliary zone, lens, and retina, the structure of the eye peculiar to sharks is described. Visual function as revealed by electrophysiology, photochemistry, and behavioral studies is also reviewed. The discussion ends with a description of structure and function of the elasmobranch median eye. The overall impression is that far from having poor vision, these extremely successful marine predators apparently have been provided with a high degree of visual development. While advances in our understanding of the shark eye have been impressive, much work remains, and, for example, entire areas such as resolution and spatial vision are unstudied. Probably the greatest mystery is the relation between the apparently exquisitely adapted visual system and the natural behavior of sharks. Thus what is needed is a linking hypothesis between laboratory studies of vision and the natural behavior of sharks as observed in the field.

77-001953 Jollie, M. T. SEGMENTATION OF THE VERTEBRATE HEAD. Am. Zool. 17 (2): 323-333. 1977. SFA 22(4)
[Biol. Sci., North. Ill. Univ., DeKalb, IL 60115]

77-001954 Kalashnikova, Z. M. ON THE CLASSIFICATION OF MORPHOLOGICAL ELEMENTS IN THE BLOOD OF FISH. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 459-472. 1976. SFA 22(4)
[Dep. Ichthyol., Moscow Univ., Moscow, USSR] The present position on the question of the genesis and classification of cellular elements of the blood in fish is examined on the basis of a critical review of the main works of Russian and foreign authors. Diagrams of hemopoietic classification (hemopoiesis) are given.

77-001955 Kashapova, L. A.; Sakharov, D. A. DOUBLE INNERVATION OF FAST FIBERS OF THE TRUNK MUSCULATURE OF LARVAL LAMPREY. Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.) 231 (1-6): 605-607. May 1977. SFA 22(4)
[Inst. Biol. Phys., USSR Acad. Sci., Moscow, USSR]

77-001956 Kikuchi, S. MITOCHONDRIA-RICH (CHLORIDE) CELLS IN THE GILL EPITHELIA FROM FOUR SPECIES OF STENOHALINE FRESH WATER TELEOSTS. Cell Tissue Res. 180 (1): 87-98. 1977. SFA 22(4)
[Dep. Biol., Iwate Med. Univ., Morioka, Japan]

77-001957 Komada, N. INFLUENCE OF TEMPERATURE ON THE VERTEBRAL NUMBER OF THE AYU, /PLECOGLOSSUS ALTIVELIS/. Copeia 1977 (3): 572-573. 25 Aug. 1977. SFA 22(4)
[Dep. Gen. Anat., Gifu Coll. Dent., 1851 Takano, Hozumi-cho, Motosu-gun, Gifu-ken, Japan]

77-001958 Komada, N. THE NUMBER OF SEGMENTS AND BODY LENGTH OF /PLECOGLOSSUS ALTIVELIS/ FRY IN THE NAGARA RIVER, JAPAN. Copeia 1977 (3): 573-574. 25 Aug. 1977. SFA 22(4)
[Dep. Gen. Anat., Gifu Coll. Dent., 1851 Takano, Hozumi-cho, Motosu-gun, Gifu-ken, Japan]

77-001959 Kreutzberg, G. W.; Gross, G. W. GENERAL MORPHOLOGY AND AXONAL ULTRASTRUCTURE OF THE OLFACTORY NERVE OF THE PIKE, /ESOX LUCIUS/. Cell Tissue Res. 181 (4): 443-457. 1977. SFA 22(4)
[Max Planck Inst. Psychiatr., Munich, West Germany]

77-001960 Laale, H. W. CULTURE AND PRELIMINARY OBSERVATIONS OF FOLLICULAR ISOLATES FROM ADULT ZEBRA FISH, /BRACHYDANIO RERIO/. Can. J. Zool. 55 (2): 304-309. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] A medium is described for the culture of follicular isolates from adult female zebra fish, /Brachydanio rerio/. Preliminary observations are made on the behavior of the cells of the cultured isolates in the absence of an oocyte and ovarian influence.

77-001961 Manion, P. J.; Hanson, L. H. ABNORMAL TOOTH DEVELOPMENT IN A SEA LAMPREY. Prog. Fish-Cult. 39 (3): 127-128. July 1977. SFA 22(4)
[U.S. FWS, Sea Lamprey Control Stn., Marquette, MI 49855]

77-001962 Marsh, E. STRUCTURAL MODIFICATIONS OF THE PECTORAL FIN RAYS IN THE ORDER PLEURONECTIFORMES. Copeia 1977 (3): 575-578. 25 Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Texas, Austin 78712]

77-001963 McPhail, J. D. A POSSIBLE FUNCTION OF THE CAUDAL SPOT IN CHARACID FISHES. Can. J. Zool. 55 (7): 1063-1066. July 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. British Columbia, 2075 Wesbrook Place, Vancouver, BC V6T 1W5, Canada] The suggestion that caudal pigment spots in fishes can act as deflection marks is tested experimentally. Fish with artificial caudal spots escape predators more often than the same species without spots, but the difference was not significant (0.1 less than /p/ less than 0.2). However in fish captured, the place on the body where the fish was seized was shifted posteriorly by the presence of a spot (/p/ less than 0.01). Although the results are equivocal, they do suggest a possible selective basis for convergence in colour pattern in small characid fishes.

77-001964 Moodie, G. E. E. MERISTIC VARIATION, ASYMMETRY, AND ASPECTS OF THE HABITAT OF /CULAEA INCONSTANS/ (KIRTLAND), THE BROOK STICKLEBACK, IN MANITOBA. Can. J. Zool. 55 (2): 398-404. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Univ. Winnipeg, Winnipeg, MB R3B 2E9, Canada] Phenetic traits were compared in 45 /Culaea inconstans/ populations in southern Manitoba. Small body size characterized individuals of populations exposed to potentially predatory fishes. Skewing of the gill-raker distributions were greatest among populations sympatric with /Umbra limi/, a potential food competitor and predator. These patterns of variation are in some aspects similar to and in others contrast with those found in another stickleback, /Gasterosteus aculeatus/. Less fluctuating asymmetry occurred in the pectoral fin rays of stream-dwelling populations than in those of lakes. Care will be required in using fluctuating asymmetry as an indicator of environmental stress.

77-001965 Moshkov, D. A.; Niukkanen, N. L. ULTRASTRUCTURAL STUDY OF THE PLASTIC PROPERTIES OF FISH MAUTHNER NEURONS. Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.) 231 (1-6): 564-567. May 1977. SFA 22(4)
[Inst. Biol. Phys., USSR Acad. Sci., Moscow, USSR]

77-001966 Moss, M. L. SKELETAL TISSUES IN SHARKS. Am. Zool. 17 (2): 335-342. 1977. SFA 22(4)
[Dep. Anat., Columbia Univ., New York, NY 10032] Recent data on shark skeletal tissues have been reviewed. It is now reasonably certain that shark teeth and denticles are covered with a true ectodermal enamel, although the outer layer of these structures is structurally complex, consisting of both calcified ectodermal enamel and uncalcified areas of ectomesenchymal origin. The intradermal base of these structures most probably consists of acellular bone. The strucutral array of apatite crystallites in the teeth seems strongly correlated with the specific shape and function of individual teeth. The calcified cartilage of sharks differs significantly from that of other vertebrates, not only in its composition, but in the fact that the areas of calcification are composed of many vital and non-hypertophic cells. Recent studies of the mineralization processes of other vertebrate tissues suggest a possible explanation for the classically described differential patterns of calcification of shark cartiliages, but the specific details in elasmobranchs are as yet unknown, as indeed are many other aspects of their skeletal tissues whose future investigation would surely be useful in the elucidation of the general processes of vertebrate skeletal tissue mineralization.

77-001967 Motta, P. J. ANATOMY AND FUNCTIONAL MORPHOLOGY OF DERMAL CALLAGEN FIBERS IN SHARKS. Copeia 1977 (3): 454-464. 25 Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Hawaii, Honolulu 96822]

77-001968 Page, L. M. THE LATERALIS SYSTEM OF DARTERS (ETHEOSTOMATINI). Copeia 1977 (3): 472-475. 25 Aug. 1977. SFA 22(4)
[Ill. Nat. Hist. Surv., Urbana 61801] In all species of /Percina/, the primitive darter genus, the lateral line is complete and the head canals are uninterrupted. In the advanced genera, /Ammocrypta/ and /Etheostoma/, reductions of various portions of the lateralis system have occurred in many of the subgenera. The number of reductions is an indication of relative evolutionary advancement, and contrasts are made between evolutionary positions suggested by the lateralis data

77-001968 CONTINUED
and those proposed in 1955 by Bailey and Gosline.

77-001969 Pickering, A. D.; Morris, R. SEXUAL DIMORPHISM IN THE GILLS OF THE SPAWNING RIVER LAMPREY, /LAMPETRA FLUVIATILIS/ L. Cell Tissue Res. 180 (1): 1-10, 1977. SFA 22(4)
[Freshwater Biol. Assoc., Ferry House, Far Sawrey, Nr. Ambliside, Cumbria, England]

77-001970 Pilotto, F.; Filosi, M. RELATIONSHIP BETWEEN COLLAGEN FIBRIL DIAMETERS AND BODY SIZE. STUDY OF FISH DERMA. Cell Tissue Res. 182 (1): 119-131. 1977. SFA 22(4)
[Ist. Istol. Embriol., Fac. Sci., Univ. delgi Studi di Milano, Milano, Italy]

77-001971 Popper, A. N.; Fay, R. R. STRUCTURE AND FUNCTION OF THE ELASMOBRANCH AUDITORY SYSTEM. Am. Zool. 17 (2): 443-452. 1977. SFA 22(4)
[Dep. Zool., Univ. Hawaii, Honolulu 96822] Behavioral evidence indicates that sharks detect underwater sound at frequencies up to 1000 Hz, and that certain low frequency signals attract sharks from large distances. It appears that the adequate stimulus for "sound detecting" systems of the shark is particle motion, as opposed to fluctuations in sound pressure. The elasmobranch ear consists of the three semi-circular canals for detecting angular accelerations, and otolith organs for detecting linear motion and accelerations due to gravity. Two of these organs, the sacculus and macula neglecta, have been shown to be responsive to vibratory motion, with the macula neglecta having best sensitivity to vertical movements. A direct vibrational pathway exists to the macula neglecta from the parietal fossa of the dorsal chondrocranium. It is not clear at present, however, whether it is the inner ear or the lateral line system which is responsible for hearing. Both detection systems are theoretically capable of providing information to the brain about sound source location using non-parallel arrays of directionally sensitive hair-cell receptors. Recent theories of underwater sound localization by fishes and sharks suggest that the ability to detect a vertical displacement component of an acoustic signal (e.g., via the macula neglecta) is necessary for instantaneous location decisions. It is not known, however, whether the sharks localize by processing information about various aspects of the sound field simultaneously (in parallel), or whether the sound field is sampled successively at different points in space. Clearly, more experimental work on the physiology of elasmobranch acousitic behavior is called for.

77-001972 Rybachuk, V. K. FEATURES OF THE STRUCTURE OF THE SKELETON AND CAUDAL FIN MUSCLES IN /SEBASTES NEBULOSUS/ AND /SEBASTES JORDANI/ (SEBASTINAE, SCORPAENIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 452-458. 1976. SFA 22(4)
[A. I. Herzen Leningrad Inst. Educ., Leningrad, USSR] The structure of the skeleton and muscles of the caudal fin was investigated in species of the ocean perch (Sebastinae) with a rounded caudal fin /Sebastes nebulosus/ and an emarginate caudal fin /Sebastes jordani/. The overall structural design is very similar in both species, the differences consist in the relative thickness of the individual skeletal elements and also of the muscles of the caudal fin. In /S. nebulosus/, with the exception of vertebral centra and the larger hypurals, the skeletal elements and the muscles of the fin are thicker and the attachment of the rays to the hypurals weaker than in /S. jordani/; this indicates greater independence in the function of the

77-001972 CONTINUED
fin. The structure of the skeleton and caudal fin muscles of these species is very similar to that in some groups of the order Perciformes.

77-001973 Wakita, M.; Itoh, K.; Kobayashi, S. TOOTH REPLACEMENT IN THE TELEOST FISH /PRIONURUS MICROLEPIDOTUS/ LACEPEDE. J. Morphol. 153 (1): 129-141. July 1977. SFA 22(4)
[Inst. Anat. Ruhr-Univ. Bochum, 4630 Bochum 1, Universitatsstrasse 150, Postfach 102148, Geb. MA 5-162, West Germany]

77-001974 Yacob, A.; Kunz, Y. W. 'DISK SHEDDING' IN THE CONE OUTER SEGMENTS OF THE TELEOST, /POECILIA RETICULATA/ P. Cell Tissue Res 181 (4): 487-492. 1977. SFA 22(4)
[Dep. Zool., University Coll., Dublin, Ireland]

77-001975 Yakovleva, A. S.; Amstislavskiy, A. Z.; Baymuratov, A. FEATURES OF THE RELATIVE GROWTH OF SOME INTERNAL ORGANS IN THE PERCH, /PERCA FLUVIATILIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 419-426. 1976. SFA 22(4)
[Ural Sci. Cent., Sverdlovsk, USSR] The morphophysiological features and nature of the changes in internal indicators of three populations of the perch, /Perca fluviatilis/, from various waters of the USSR were studied. The population specificity of the relationship between the body weight and brain was established; the heart index shows a tendency to decrease as the body weight of the fish increases. The interpopulation differences in the relative sizes of the organs of the perch studied provide a basis for assessing the specifics of the living conditions of fish from different populations.

PHYSIOLOGY

77-001976 Abe, H.; Shimizu, C.; Matsuura, F. NAD (P) HYDROLYZING ENZYMES IN SKIPJACK LIVER--II. PHYSICO-CHEMICAL AND ENZYMATIC PROPERTIES OF NAD (P) NUCLEOSIDASE. Bull. Jpn. Soc. Sci. Fish. 43 (4): 469-476. Apr. 1976. SFA 22(4)
[Lab. Chem., Kyoritsu Women's Univ., Chiyoda-ku, Tokyo, Japan]

77-001977 Abell, P. R.; Burton, D. T.; Moore, C. J. TIME COURSE OF THERMAL ACCLIMATION IN ATLANTIC SILVERSIDE (/MENIDIA MENIDIA/) EXPOSED TO CYCLIC TEMPERATURES. ASB (Assoc. Southeast. Biol.) Bull. 24 (2): 34. 1977. SFA 22(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD] This study was undertaken to determine the time course of thermal acclimation in Atlantic silverside exposed to several fluctuating low temperatures. Adult fish were acclimated for a minimum of two weeks to 15C. One group was then taken from 15C to 5C over a 10-day period (1°/day) and held at 5C for 21 days. Three groups were exposed once every 24 hours for 31 days to different fluctuating temperature cycles. The time of the descending phase (15C to 5C) for each group was 1) 1.5 hr, 2) 11 hr and 3) 22.5 hr; the ascending phase (5C to 15C) was 1.5 hr for all groups. Upper limit critical thermal maxima (CTM) were used to assess thermal acclimation after exposure to the cycles for various periods of time up to 31 days. All CTM measurements were made at maximum phase (15C). The CTM of all cyclic groups decreased significantly between 5 and 10 days when compared to the 15C acclimated controls. The CTM of all cyclic groups were significantly

77-001977 CONTINUED
higher than those of fish held continuously for 21 days at 5C. This study indicates that Atlantic silverside exposed to cyclic low temperatures adjust to intermediate temperature(s) between the minimum and maximum rather than toward the maximum as has been suggested for fish exposed to cyclic elevated temperatures.--From abstr.

77-001978 Asakawa, M. SIALIC ACID-CONTAINING GLYCOPROTEIN IN THE EXTERNAL MUCUS OF EEL, /ANGUILLA JAPONICA/ TEMMINCK ET SCHLEGEL--III. ALKALINE-REDUCTIVE CLEAVAGE OF SIALIC ACID-CONTAINING GLYCOPROTEIN. Bull. Jpn. Soc. Sci. Fish. 43 (6): 727-731. June 1977. SFA 22(4)
[Fac. Educ. Kumamoto Univ., Kumamoto 860, Japan]

77-001979 Beitz, B. E. SECRETION OF RECTAL GLAND FLUID BY THE ATLANTIC STINGRAY, /DASYATIS SABINA/. Copeia 1977 (3): 585-587. 25 Aug. 1977. SFA 22(4)
[14 Sunset Dr., Fredonia, NY 14063]

77-001980 Berlin, W. H.; Brooke, L. T.; Stone, L. J. VERIFICATION OF A MODEL FOR PREDICTING THE EFFECT OF INCONSTANT TEMPERATURE ON EMBRYONIC DEVELOPMENT OF LAKE WHITEFISH (/COREGONUS CLUPEAFORMIS/). U.S. Fish Wildl. Serv. Tech. Pap. 92. 6p. 1977. SFA 22(4)
[U.S. FWS, Great Lakes Fish. Lab., 1451 Green Rd., Ann Arbor, MI 48105] Eggs stripped from lake whitefish spawning in Lake Michigan were incubated in the laboratory at temperatures similar to those on whitefish spawning grounds in Lake Michigan during December-April. Observed times from fertilization to attainment of each of 21 developmental stages were used to test a model that predicts the rate of development at daily fluctuating temperatures. Observed times agreed well with times predicted by the model; the observed time of 135 days from fertilization to hatching was only 5 days less than the predicted time of 140 days. The model was further verified by applying it to unpublished data supplied by the Ontario Ministry of Natural Resources, for eggs from Lake Huron whitefish incubated in the laboratory in untempered Lake Huron water. The model was used to predict the effects of small temperature increases (caused by a hypothetical waste-heat discharge) on the rate of deveopment and time of hatching of lake whitefish eggs. According to this simulation, continuous addition of waste heat sufficient to raise the temperature 1, 2, or 3 C above ambient on the spawning grounds during December-April would advance the time of hatching 8, 16, or 21 days, respectively. Possible effects of this advancement on the reproductive success of whitefish are discussed.--From abstr

77-001981 Billard, R.; Peter, R. E. GONADOTROPIN RELEASE AFTER IMPLANTATION OF ANTI-ESTROGENS IN THE PITUITARY AND HYPOTHALAMUS OF GOLDFISH, /CARASSIUS AURATUS/. Gen. Comp. Endocrinol. 32 (2): 213-220. June 1977. SFA 22(4)
[Inst. Natl. Rech. Agron., Lab. Physiol. Poissons, 78350 Jouy-en-Josas, France]

77-001982 Boord, R. L.; Campbell, C. B. G. STRUCTURAL AND FUNCTIONAL ORGANIZATION OF THE LATERAL LINE SYSTEM OF SHARKS. Am. Zool. 17 (2): 431-441. 1977. SFA 22(4)
[Dep. Biol. Sci., Univ. Del., Newark 19711]

77-001983 Bornancin, M.; De Renzis, G.; Maetz, J. BRANCHIAL CL TRANSPORT, ANION-STIMULATED ATPASE AND ACID-BASE BALANCE IN /ANGUILLA ANGUILLA/ ADAPTED TO FRESHWATER: EFFECTS OF HYPEROXIA. J. Comp. Physiol. B Metab. Transp. Funct. 117 (3): 313-322. 1977. SFA 22(4)
[Univ. Nice, France]

77-001984 Breton, B.; Billard, R. EFFECTS OF PHOTOPERIOD AND TEMPERATURE ON PLASMA GONADOTROPIN AND SPERMATOGENESIS IN THE RAINBOW TROUT /SALMO GAIRDNERII/ RICHARDSON. Ann. Biol. Anim. Biochim. Biophys. 17 (3A): 331-340. 1977. SFA 22(4)
[Lab. Physiol. Poissons, I.N.R.A., 78350 Jouy-en-Josas, France] Two-year old male rainbow trout, /Salmo gairdnerii/, were exposed to the following photoperiods at 8° or 16°C from February 24 to June 19: constant short photoperiod (8L + 16D), constant long photoperiod (16L + 8D), and gradually decreasing photoperiod (from 16 L to 8 L). Control fish were exposed to natural photoperiod and temperature. Plasma and pituitary gonadotropin levels were determined by radioimmunoassay and correlated with spermatogenic response in testes. Control fish did not show advancement of spermatogenesis, whereas those exposed to decreasing photoperiod at 8° or 16°C showed complete induction of spermatogenesis. While cooler temperature favoured production of spermatogonia and spermatocytes, the warmer temperature stimulated formation of spermatids and spermatozoa. On the other hand, in trout exposed to constant short or constant long photoperiod, spermatogenic response was weak at both temperatures. Plasma GtH levels increased in groups kept under decreasing photoperiod at both 8°C as well as 16°C; the magnitude of rise of GtH was greater at 16°C than at 8°C. The data suggest that the optimum photothermal combination for GtH release and induction of spermatogenesis in the rainbow trout is a gradually decreasing photoperiod (from 16L to 8L) at 16°C.

77-001985 Brown, S.; Eales, J. G. MEASUREMENT OF L-THYROXINE AND 3, 5,3'-TRIIODO-L-THYRONINE LEVELS IN FISH PLASMA BY RADIOIMMUNOASSAY. Can. J. Zool. 55 (2): 293-299. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

77-001986 Buss, D.; Warner, F. D. SEASONAL ULTRASTRUCTURAL VARIATIONS IN THE ROSTRAL NEUROHYPOPHYSIS OF THE ALEWIFE IN LAKE MICHIGAN. Proc. Conf. Great Lakes Res. 15: 35-44. 1972. SFA 22(4)

77-001987 Chervinski, J. ADAPTABILITY OF /CHELON LABROSUS/ (RISSO) AND /LIZA SALIENS/ (RISSO) (PISCES, MUGILIDAE) TO FRESH WATER. Aquaculture 11 (1): 75-79. May 1977. SFA 22(4)
[Fish Aqua-Cult. Res. Stn., Dor, Israel] Experiments were conducted to determine the adaptability of young thick-lip grey mullet /Chelon labrosus/ (Risso) and leaping grey mullet /Liza saliens/ (Risso) to various salt concentrations. Young thick-lip grey mullet (total length 18-32 mm) were subjected to abrupt changes from saltwater to freshwater media. No mortality occurred with salinity decrease, even with an abrupt change from 100 percent sea water (/S/ = 39°/oo) to fresh water (/S/ = 0.4°/oo). Young leaping grey mullet (total length

25-43 mm) were subjected to abrupt changes from saltwater to freshwater media. No mortality occurred with salinity decrease, even with an abrupt change from 100 percent sea water (/S/ = 39°/oo) to 5 percent sea water (/S/ = 1.95°/oo). Sixty five percent of the fish died with abrupt salinity change from 100 percent sea water to 0 percent sea water (/S/ = 0.4°/oo). With a gradual decrease from 5 percent sea water to fresh water (/S/ = 0.4°/oo) all fish survived.

77-001988 Chervinski, J. NOTE ON THE ADAPTABILITY OF SILVER CARP--/HYPOPHTHALMICHTHYS MOLITRIX/ (VAL.)--AND GRASS CARP--/CTENOPHARYNGODON IDELLA/ (VAL.)--TO VARIOUS SALINE CONCENTRATIONS. Aquaculture 11 (2): 179-182. June 1977. SFA 22(4)

[Fish Aquacult. Res. Stn., Dor, Israel] A preliminary investigation was carried out to determine the feasibility of rearing two species of Chinese carp in brackishwater ponds in areas unsuitable for agriculture. Silver carp (/Hypophthalmichthys molitrix/) and grass carp (/Ctenopharyngodon idella/) were transferred from fresh water to mixtures of sea water and tap water (20, 25 and 30 percent sea water) in the laboratory. All the carp survived for 48 h after transfer to the first concentration; there was 0 percent and 100 percent mortality of silver carp within 48 h in 25 and 30 percent sea water respectively, while the grass carp also only died in 30 percent sea water (20 percent mortality). After acclimatization for 48 h to 20 or 25 percent sea water and transfer to 30 percent sea water, about half the grass carp survived a further 48 h, whereas survival rates for silver carp were 16 percent (transfer from 20 to 30 percent sea water) and 10 percent (transfer from 25 to 30 percent) after 48 h. No silver carp survived in 25 percent sea water for 30 days. However, only 25 percent of the grass carp exposed to this salinity for the same period of time died.

77-001989 Clarke, W. C.; Blackburn, J. A SEAWATER CHALLENGE TEST TO MEASURE SMOLTING OF JUVENILE SALMON. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 705. iii + 11p. 1977. In English with French summ. SFA 22(4)

[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada] A simple test of osmoregulatory capacity was developed to provide a measure of the readiness of juvenile salmon to grow in sea water. The fish are transferred directly from fresh water to sea water at their acclimation temperature. After 24 hr, the fish are sacrificed and a plasma sample is taken for sodium determination. Smolts are capable of regulating their plasma sodium concentration at or near the normal level within 24 hr of transfer to sea water. However, parr suffer a substantial elevation of plasma sodium concentration in sea water which may persist for several days. Data are presented to illustrate application of the test to juvenile coho, sockeye and chinook salmon.

77-001990 Craig, J. F. THE BODY COMPOSITION OF ADULT PERCH, /PERCA FLUVIATILIS/ IN WINDERMERE, WITH REFERENCE TO SEASONAL CHANGES AND REPRODUCTION. J. Anim. Ecol. 46 (2): 617-632. June 1977. SFA 22(4)

[Freshwater Biol. Assoc., Ferry House, Far Sawrey, Ambleside, Cumbria, England]

77-001991 Crawford, B. A.; Leider, S. A.; Tipping, J. M. TECHNIQUE FOR RAPIDLY TAKING SAMPLES OF SKELETAL MUSCLE FROM LIVE ADULT STEELHEAD TROUT. Prog. Fish-Cult. 39 (3): 125. July 1977. SFA 22(4)
[Wash. State Dep. Game, Olympia 98504]

77-001992 Dabrowski, K.; Glogowski, J. STUDIES ON THE ROLE OF EXOGENOUS PROTEOLYTIC ENZYMES IN DIGESTION PROCESSES IN FISH. Hydrobiologia 54 (2): 129-134. 1 June 1977. SFA 22(4)
[Inst. Ichthyol. Fish., Agric.-Tech. Acad., Olsztyn, Poland]

77-001993 Davis, T. L. O. REPRODUCTIVE BIOLOGY OF THE FRESHWATER CATFISH, /TANDANUS TANDANUS/ MITCHELL, IN TEH GWYDIR RIVER, AUSTRALIA. I. STRUCTURE OF THE GONADS. Aust. J. Mar. Freshwater Res. 28 (2): 139-158. Apr. 1977. SFA 22(4)
[Zool. Dep., Univ. New England, Armidale, N.S.W. 2351, Australia]
The gross morphology and histology of the gonads of /T. tandanus/ were examined as a preliminary to describing the reproductive cycle of this species in the Gwydir River. The macroscopic appearance of the gonads at different stages of maturity is described. The complicated structure of the testes made it difficult to classify them into well-defined stages of maturity. The relationship between the stage of maturity of the ovaries and the histological changes associated with oocyte maturation was clear cut. Six spermatogenetic stages were recognized; primary germ cells, spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, and spermatozoa. The sequence of oocyte maturation was divided into nine stages; chromatin nucleolus, early perinucleolus, late perinucleolus, yolk vesicle, primary yolk, secondary yolk, tertiary yolk, and ripe egg stage. Atresia was observed in some oocytes from the primary yolk stage onwards. The sequence of yolk resorption in atretic oocytes is described.

77-001994 de Vlaming, V. L.; Vodicnik, M. J.; Bauer, G.; Murphy, T.; Evans, D. ESTRADIOL-17BETA EFFECTS ON LIPID AND CARBOHYDRATE METABOLISM AND ON THE INDUCTION OF A YOLK PRECURSOR IN GOLDFISH, /CARASSIUS AURATUS/. Life Sci. 20 (12): 1945-1952. 15 June 1977. SFA 22(4)
[Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

77-001995 Demski, L. S. ELECTRICAL STIMULATION OF THE SHARK BRAIN. Am. Zool. 17 (2): 487-500. 1977. SFA 22(4)
[Dep. Anat., La. State Univ. Med. Cent., New Orleans 70119]

77-001996 Denis, H.; Wegnez, M. BIOCHEMICAL RESEARCH ON OOGENESIS. OOCYTES AND LIVER CELLS OF THE TELEOST FISH /TINCA TINCA/ CONTAIN DIFFERENT KINDS OF 5S RNA. Dev. Biol. 59 (2): 228-236. Sept. 1977. SFA 22(4)
[Cent. Genet. Mol., CNRS F-91190 Gif-sur-Yvette, France]

77-001997 Diener, D. R. PROTOGYNOUS HERMAPHRODITISM IN THE LABRID /DECODON MELASMA/. Copeia 1977 (3): 589-591. 25 Aug. 1977. SFA 22(4)
[Mar. Ecol. Consult., 533 Stevens Ave., Suite D-27, Solena Beach, CA 92075]

77-001998 Epple, A.; Lewis, T. L. METABOLIC EFFECTS OF PANCREATECTOMY AND HYPOPHYSECTOMY IN THE YELLOW AMERICAN EEL, /ANGUILLA ROSTRATA/ LESUEUR. Gen. Comp. Endocrinol. 32 (3): 294-315. July 1977. SFA 22(4)
[Daniel Baugh Inst. Anat., Jefferson Med. Coll. Thomas Jefferson Univ., Philadelphia, PA 19107]

77-001999 Erskine, D. J.; Spotila, J. R. HEAT-ENERGY-BUDGET ANALYSIS AND HEAT TRANSFER IN THE LARGEMOUTH BLACKBASS (/MICROPTERUS SALMOIDES/). Physiol. Zool. 50 (3): 157-169. July 1977. SFA 22(4)
[Dep. Zool., Univ. Okla., Norman 73019] A heat-energy-budget equation was developed to describe the heat-energy exchange between a fresh-water fish and its aquatic environment. Experimentally derived heat-transfer coefficients varied directly with water velocity. This relationship was clarified by the use of dimensionless variables. Heat-transfer coefficients were approximately two orders of magnitude greater than similar coefficients determined for terrestrial organisms. Rapid heat transfer occurs between a fish and the surrounding water because of a reduced boundary-layer thickness in water and the high heat capacity of this fluid. It appears that in still or moving water the major avenue of heat exchange for fresh-water fish is via the direct transfer of heat from/to the body surface to/from the water. The physical interactions between fish and water preclude the development of thermoregulatory adaptations such as changes in the thickness of insulation and circulatory modifications in all but the largest fish.

77-002000 Fahmy, F. K. SOME ASPECTS OF TEMPERATURE ACCLIMATION IN THE BROOK TROUT (/SALVELINUS FONTINALIS/, MITCHILL). Ph.D. dissertation, Univ. Toronto (Canada) 1974. From Diss. Abst. Int. B Sci. Eng. 37(12), 1977. SFA 22(4)
The physiological nature of the processes which allow poikilotherms to change their thermal resistance when acclimated at different temperatures is not clear. The present study was an attempt to investigate whether acclimation to temperature is controlled by one particular system, such as the nervous system, or whether acclimation is locally induced in the various tissues of the organism. The response of the whole fish to lethal temperature depended on the mean thermal history of the total tissue regardless of the anatomical site. When a section of a heterogeneously acclimated fish was exposed to the lethal temperature the response of the fish varied according to the level of acclimation of that section. Cells isolated from fish acclimated at different temperatures reflected the effects of acclimation. Those which were obtained from warm-acclimated fish were more thermostable than those obtained from cold-acclimated fish. However, the difference in thermostability decreased at higher lethal temperatures. This finding could explain the controversy in the literature where some investigators were able to detect temperature acclimation at the cellular and subcellular levels while others who performed their tests at relatively higher temperatures could not. The serum had no significant effects on the thermostability of the kidney cells. It seems that the acclimatory modifications occur within the cells themselves and not in the circulating medium which surrounds them.--From abstr.

77-002001 Farkas, T.; Csengeri, I.; Majoros, F.; Olah, J. METABOLISM OF FATTY ACIDS IN FISH. I. DEVELOPMENT OF ESSENTIAL FATTY ACID DEFICIENCY IN THE CARP, /CYPRINUS CARPIO/ LINNAEUS 1758. Aquaculture 11 (2): 147-157. June 1977. SFA 22(4)

[Inst. Biochem., Biol. Res. Cent. Hungarian Acad. Sci., H-6701 Szeged, Hungary] Carp, 15-25 g in weight, were maintained on diets containing linolenic acid in various concentrations (0.5, 1.0, 3.4 and 11.1 mg/g food) for 4 weeks and the fatty acid composition of liver total lipids as well as that of liver triglycerides and phospholipids was determined. The fish ingesting the diet containing 1.1 percent linolenate accumulated only negligible amounts of 20:3 omega 9 and exhibited a low ratio of 20:3 omega 9 to 22:6 omega 3 (0.07) in the total lipid. This ratio increased from 0.33 to 2.00 in liver total lipids of fish ingesting 3.4, 1.0 and 0.5 mg linolenic acid in 1 g of food. This effect was more pronounced in the phospholipids. The level of oleic acid in triglycerides was inversely related to the concentration of linolenic acid in the diet. Linoleic acid at a concentration of 13-16 mg/g food was unable to prevent the accumulation of 20:3 omega 9 in the lipids of fish ingesting diets containing a low level of linolenate. The possible effects of dietary linolenate on the fatty acid metabolism of fish are discussed.

77-002002 Fedorova, L. S. PHYSIOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF THE REPRODUCTIVE PRODUCTS AND LARVAE OF STURGEONS DURING ARTIFICIAL REARING. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 427-436. 1976. SFA 22(4)

[AzNIRKh, Rostov-on-Don, USSR] The biochemical indicators determining the physiological state of the spawners of the sturgeon, /Acipenser guldenstadti/, and the beluga, /Huso huso/, after pituitary injections were studied. The influence of hormonal stimulation on the quality of sexual products and the quality of the larvae was determined. A relationship was established between the physiological state of the spawners, the degree of maturity of the ovulated ova, percentage of fertilization and of egg mortality as well as of larvae in ponds prior to the transition to exogenous feeding. A relationship exists between the biochemical state of the blood serum and the degree of maturity of the sexual products. It is possible to verify the state of the females during maturation from the concentration of total protein and of some amino acids in a single oocyte.

77-002003 Fletcher, C. R. POTENTIAL DEPENDENCE OF SODIUM FLUXES ACROSS THE GILLS OF MARINE TELEOSTS. J. Comp. Physiol. B Metab. Transp. Funct. 117 (3): 277-289. 1977. SFA 22(4)

[Dep. Pure Appl. Zool., Univ. Leeds, Leeds LS2 9JT, England]

77-002004 Freihofer, W. C.; Compagno, L. J. V.; Rogers, W. ADDITIONAL NOTES ON THE USE OF THE SIHLER TECHNIQUE OF STAINING NERVES OF SMALL, WHOLE SPECIMENS OF FISHES AND OTHER VERTEBRATES. Copeia 1977 (3): 587-588. 25 Aug. 1977. SFA 22(4)

[Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

77-002005 Fridberg, G.; Ekengren, B. THE VASCULARIZATION AND THE NEUROENDOCRINE PATHWAYS OF THE PITUITARY GLAND IN THE ATLANTIC SALMON, /SALMO SALAR/. Can. J. Zool. 55 (8): 1284-1296. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Stockholm, Box 6801, S-113 86 Stockholm, Sweden]

77-002006 Galli-Gallardo, S. M.; Marusic, E. T.; Pang, P. K. T. STUDIES ON THE STANNIUS CORPUSCLES OF THE CHILEAN CLINGFISH, /SICYASES SANGUINEUS/. Gen. Comp. Endocrinol. 32 (3): 316-320. July 1977. SFA 22(4)
[Dr. P. K. T. Pang: Sch. Med., Texas Tech Univ., Lubbock 79409]

77-002007 Gatesoupe, F. J.; Leger, C.; Metailler, R.; Luquet, P. ALIMENTATION LIPIDIQUE DU TURBOT (/SCOPHTHALMUS MAXIMUS/ L.) I. INFLUENCE DE LA LONGUEUR DE CHAINE DES ACIDES GRAS DE LA SERIE W3. [LIPID FEEDING OF TURBOT (/SCOPHTHALMUS MAXIMUS/ L.). I. INFLUENCE OF THE CHAIN LENGTH OF FATTY ACIDS OF THE OMEGA (3) SERIES.] Ann. Hydrobiol. 8 (1): 89-97. 1977. In French with English summ. SFA 22(4)
[I.N.R.A., 78350 Jouy-en-josas, France] Turbots (/Scophthalmus maximus/ L.) were fed with diets including 45 p. 100 protein from defatted herring meal and 10 p. 100 lipids of variable composition. The control diet contained pure Capelan oil and the three experimental diets were prepared so as to allow a comparison to be made of the efficiency of fatty acids of the omega (3) series according th chain length: The AO mixture--containing peanut oil and oleic acid in the proportion 79/21--almost did not supply acids of this series, pure Primor oil provided 0.55 p. 100 linolenic acid and the CAL mixture, including Capelan oil, peanut oil and linoleic acid in the proportions 39/56/5, gave 0.76 p. 100 omega (3) acids with twenty carbon atoms or more. The linoleic acid content was similar in the three diets (2p. 100) and thus prevented a possible effect of the level of omega (3) acids on the requirement for omega (3) acids. A difference already appeared from the 4th week and after six weeks, the relative weight gain expressed in per cent of the initial weight was 49 p. 100 for the control group (Capelan oil), 45 p. 100 for the group receiving the CAL mixture and only 30 p. 100 in the groups AO and Primor. The feed conversion ratio was 1.4 and 1.3, respectively for the two former and 1.6 for the two latter groups. These results show that the turbot exhibits a specific requirement for long-chain polyunsaturated fatty acids of the omega (3) series. The diet must contain at least 0.8 p. 100 of these fatty acids to meet the requirements which cannot be satisfied by using an equivalent amount of linolenic acid either because of the insufficient elongation rate or because of the absence of the enzymes responsible for these reactions.

77-002008 Gillet, C.; Billard, R.; Breton, B. EFFETS DE LA TEMPERATURE SUR LE TAUX DE GONADOTROPINE PLASMATIQUE ET LA SPERMATOGENESE DU POISSON ROUGE /CARASSIUS AURATUS/. [EFFECTS OF TEMPERATURE ON THE RATE OF PLASMA GONADOTROPIN AND SPERMATOGENESIS IN THE GOLDFISH /CARASSIUS AURATUS/.] Can. J. Zool. 55 (1): 242-245. Jan 1977. In French with English summ. SFA 22(4)
[Inst. Natl. Rech. Agron., Lab. Physiol. Poissons, 78350 Jouy-en-Josas, France] Concentrations of immunoreactive plasma gonadotropin (c-GtH) were measured for goldfish kept at conditions of temperature held constant or increasing between 10 and 30 °C, between February and July. At temperatures of 17 °C or above the levels of plasma c-GtH were significantly (/P/ less than 0.005) higher during April and May than at 10°C. In April the pituitary concentration of c-GtH was maximum for fish held at 17°C or above and the minimum for fish held

77-002008 CONTINUED
below 17°C, but in June the situation was reversed. A study of the gonads showed that spermatogenesis is faster at 17-24 °C than at 10 °C, but at 30 °C spermatogenic activity was inhibited.

77-002009 Goos, H. J. Th.; Murathanoglu, O. LOCALISATION OF GONADOTROPIN RELEASING HORMONE (GRH) IN THE FOREBRAIN AND NEUROHYPOPHYSIS OF THE TROUT (/SALMO GAIRDNERI/). AN IMMUNOFLUORSCENCE STUDY. Cell. Tissue Res. 181 (2): 163-168. 1977. SFA 22(4)
[Zool. Lab., Transitorium III, Padualaan 8, Utrecht, The Netherlands]

77-002010 Goverdovskiy, V. I. VISION OF FISHES AND LIGHT UNDER WATER. Oceanology 16 (5): 522-525. Apr. 1977. SFA 22(4)
[I. M. Sechenov Inst. Evol. Physiol. Biochem., USSR Acad. Sci., Leningrad, USSR] The view is critically examined that the visual pigments of fishes are adapted to the spectral composition of underwater illumination in such a way as to ensure the maximum absorption of light (the so-called "sensitivity hypothesis"). It is shown that conformity of visual pigments to the requirements of the "sensitivity hypothesis" would simultaneously ensure the maximum visibility range in a turbid environment. However, the absorption maxima of real visual pigments are, in general, considerably shifted toward the shorter wavelengths compared to the values required by the "sensitivity hypothesis". The actual position of the absorption maximum is assumed to be determined by a compromise between the need to attain high sensitivity and the spontaneous thermal decomposition of the visual pigments the rate of which increases sharply as absorption is shifted to the red region. This view helps to explain the "blue" shift of visual pigments in deep-sea fishes and the moderate "red" shift of fishes inhabiting turbid surface water.

77-002011 Green, J. HAEMATOLOGY AND HABITS IN CATFISH OF THE GENUS /SNYODONTIS/. J. Zool. (Lond.) 182 (1): 39-50. May 1977. SFA 22(4)
[Zool. Dep. Westfield Coll., Hampstead, London, England] African catfish of the genus /Synodontis/ vary in their habits, from inverted plankton eaters to normally oriented benthos eaters. Haemoglobin concentrations and red cell counts vary between populations of one species, and between species of differing habits. /Synodontis schall/ from the well-aerated White Nile had lower haemoglobin concentrations than members of the same species from Lake Kainji, Nigeria. /Synodontis membranaceus/, an inverted plankton eater, had lower haemoglobin concentrations than the bottom dwelling /S. filamentosus/ and /S. nigrita/. Species with intermediate habits, such as /S. batensoda/ and /S. ocellifer/ had intermediate concentrations of haemoglobin. It is suggested that these differences in haemoglobin concentration are a result of differing habits. Those species that enter poorly aerated water are stimulated to make more haemoglobin.

77-002012 Hansen, K.; Herring, P. J. DUAL BIOLUMINESCENT SYSTEMS IN THE ANGLERFISH GENUS /LINOPHRYNE/ (PISCES: CERATIOIDEA). J. Zool. (Lond.) 182 (1): 103-124. May 1977. SFA 22(4)
[Inst. Comp. Anat., Universitetasparken 15, 2100 Copenhagen O, Denmark] Females of the anglerfish genus /Linophryne/ bear barbels containing luminous organs, in additon to an escal light organ. Luminescence has been observed from the barbels of four species of /Linophryne/, and the morphology of the luminous organs investigated. The barbel light organs do not contain bacteria but complex paracrystalline photogenic granules. The esca contains luminous bacteria. The esca is ectodermal in origin whereas the barbel organs

77-002012 CONTINUED
may be derived from the mesoderm. The possible significance of this unique dual system of luminous organs is discussed.

77-002013 Hanson, P. C.; Stanley, J. G. STUDIES OF OXYGEN METABOLISM IN THE CENTRAL MUDMINNOW, /UMBRA LIMI/ (KIRTLAND). Proc. Conf. Great Lakes Res. 12: 39-44. 1969. SFA 22(4)

The effects of temperature, starvation, laboratory acclimation, body weight, and diurnal cycle upon the oxygen consumption of the central mudminnow, /Umbra limi/, were studied. Many poikilotherms remain active over a wide range of temperature because they are capable of adjusting or compensating for changes in temperature. In the present study, the central mudminnow was found to have an oxygen consumption which was independent of temperature over the temperature range, 5°C to 20°C, indicating that the mudminnow completely compensates its metabolic rate. The oxygen consumption progressively decreased during the first five days of starvation, and thereafter, the oxygen consumption remained constant. Newly collected fish were found to have higher oxygen consumptions than those acclimated to the laboratory for one month. The oxygen consumption of the mudminnow was almost directly proportional to the body weight. Mudminnows exhibit daily fluctuations of oxygen consumption, which follow the general pattern of being highest in midmorning and early afternoon and lowest during the night.

77-002014 Hayashi, K.; Takagi, T. [LIPID METABOLISM IN FISH. I. COMPARISON OF FATTY ACID COMPOSITIONS IN GILLED FISH AND IMPOUNDED FISH.] Bull. Fac. Fish. Hokkaido Univ. 27 (3-4): 172-180. Dec. 1976. In Japanese with English summ. SFA 22(4)

[Lab. Chem. Fish Oil, Fac. Fish., Hokkaido Univ., Japan]

77-002015 Hayashida, T. IMMUNOCHEMICAL AND BIOLOGICAL STUDIES WITH GROWTH HORMONE IN A PITUITARY EXTRACT OF THE COELACANTH, /LATIMERIA CHALUMNAE/ SMITH. Gen. Comp. Endocrinol. 32 (2): 221-229. June 1977. SFA 22(4)

[Dep. Anat., Univ. Calif., San Francisco 94143] A substance immunochemically related to GH has been demonstrated in an extract of a pituitary from a coelacanth which is considered to be the sole surviving member of the ancient Crossopterygians. The findings were based on studies employing radioimmunoassay with an antiserum to turtle GH which was shown recently to be capable of detecting immunochemical relatedness of purified GHs from various vertebrate species with respect to those mammals. The results demonstrated that the coelacanth extract does contain a substance which shows a low, but significant degree of relatedness to GHs of tetrapods and to a substance immunochemically related to GHs in pituitary extracts of other existing primitive fishes including the lungfish, shark and sturgeon. Bioassay of the pituitary extract revealed that it was capable of a low, but significant degree of stimulation of growth promotion in a mammal on the basis of the rat tibia assay. The significance of the results is discussed.

77-002016 Heemstra, P. C. A PECULIAR MODIFICATION OF THE INTESTINE IN THE STROMATEOID FISHES /SERIOLELLA PUNCTATA/ AND /S. BRAMA/ (PERCIFORMES: CENTROLOPHIDAE). Copeia 1977 (3): 584-585. 25 Aug. 1977. SFA 22(4)

[CSIRO Div. Fish. Oceanogr., P.O. Box 21, Cronulla, N.S.W. 2230, Australia]

77-002017 Herring, P. J. BIOLUMINESCENCE OF MARINE ORGANISMS. Nature 267 (5614): 788-793. 30 June 1977. SFA 22(4)
[Inst. Oceanogr. Sci., Wormley, Godalming, Surrey, England] Luminescence is a feature common to many marine organisms. Certain squid and fish utilise luminous bacteria as symbiotic sources of light, and the symbionts have physiological features which are of potential advantage in the association. The luciferins of some marine fishes, squids, crustaceans and coelenterates are of very similar chemical structure, though differing markedly from the luciferins of non-marine forms. Luminescence in many marine animals is probably used for ventral camouflage purposes.

77-002018 Hidaka, I.; Kirohara, S.; Oda, S. GUSTATORY RESPONES IN THE PUFFER--III. STIMULATORY EFFECTIVENESS OF NUCLEOTIDES AND THEIR DERIVATIVES. Bull. Jpn. Soc. Sci. Fish. 43 (4): 423-428. Apr. 1977. SFA 22(4)
[Fac. Fish., Mie Univ., Tsu, Japan]

77-002019 Higgs, D. A.; Fagerlund, U. H. M.; McBride, J. R.; Dye, H. M.; Donaldson, E. M. INFLUENCE OF COMBINATIONS OF BOVINE GROWTH HORMONE, 17ALPHA-METHYLTESTOSTERONE, AND L-THYROXINE ON GROWTH OF YEARLING COHO SALMON (/ONCORHYNCHUS KISUTCH/). Can. J. Zool. 55 (6): 1048-1056. June 1977. In English with French summ. SFA 22(4)
[Dep. Fish. Environ., 4160 Marine Drive, West Vancouver, BC V7V 1N6, Canada] Groups of yearling coho salmon held at 10°C on a natural photoperiod, and fed excess ration daily, were administered either bovine growth hormone (bGH; 0.0092 IU/g body weight), L-thyroxine (T(4); 1 ug/g), 17alpha-methyltestosterone (MT; 1 mg/kg diet), combinations of these hormones, or no hormone for 59 days. Fish received bGH and (or) T(4) intramuscularly once weekly. Each individual hormone and hormone combination significantly enhanced growth. The sequence noted for growth rate of the groups was as follows: (bGH + MT + T(4)) greater than (bGH + MT) greater than (bGH + T(4)) greater than bGH greater than (T(4) + MT) greater than MT greater than T(4) greater than control groups. Three hormonal interactions were additive (T(4) + MT;bGH + MT;bGH + MT + T(4)). The growth rate of fish treated with bGH + MT + T(4) was over three times that of the controls. T(4) or MT + T(4) administration significantly increased condition factors, while MT, bGH, BGH + T(4), bGH + MT, and bGH + MT + T(4) decreased them. Significant elevations in percentages of muscle water (bGH) and lipid (T(4);T(4) + MT;bGH +MT) were found. Thyroid activity (follicle epithelial height) was significantly increased in MT and MT + bGH fish, but depressed in T(4) fish. Hormone administration altered the histological structure of the endocrine pancreas (bGH and MT groups), ovary (bGH; MT groups), testis (MT groups), and interrenal tissue (bGH; MT).

77-002020 Hirose, K.; Ishida, R.; Sakai, K. INDUCED OVULATION OF AYU USING HUMAN CHORIONIC GONADOTROPIN (HCG), WITH SPECIAL REFERENCE TO CHANGES IN SEVERAL CHARACTERISTICS OF EGGS RETAINED IN THE BODY CAVITY AFTER OVULATION. Bull. Jpn. Soc. Sci. Fish. 43 (4): 409-416. Apr. 1977. SFA 22(4)
[Tokai Reg. Fish. Res. Lab., Arasaki, Nagai, Yokosuka 238-03, Japan] This study was carried out to find out the effects of delay between ovulation and handstripping, with special reference to changes in several characteristics of eggs retained in the body cavity following the induction of ovulation in the ayu with HCG. The processes after ovulation were divided into 4 stages using macroscopical and microscopical techniques. The eggs in stage I were normal while those is stage IV were completely over-ripened eggs which were observed 8

77-002020 CONTINUED
days following ovulation. The eggs in stage II were observed during the whole period of the experiment and seemed to show various qualities. The percentages of eyed eggs and hatched larvae showed their peaks one day after ovulation, followed by rapid decrease. Suggestion has been made that in the ayu the eggs remain in good condition for about 48 hr. Furthermore, the changes in body weight, GSI, water content in the eggs and concentrations of sodium, chloride and potassium in the eggs were discussed in relation to the processes of over-ripening in the ayu.

77-002021 Hitron, J. W.; Bonham, K. HERMAPHRODITISM IN A CHUM SALMON, /ONCORHYNCHUS KETA/. Copeia 1977 (3): 591-592. 25 Aug. 1977. SFA 22(4)
[Coll. Fish., Univ. Wash., Seattle 98195]

77-002022 Hogue, J. J., Jr.; Buchanan, J. P. LARVAL DEVELOPMENT OF SPOTTED SUCKER (/MINYTREMA MELANOPS/). Trans. Am. Fish. Soc. 106 (4): 347-353. July 1977. SFA 22(4)
[TVA, Fish. Waterfowl Br. Div. Forestry, Fish., Wildl. Develop., Norris, TN 37828]

77-002023 Holeton, G. F. CONSTANCY OF ARTERIAL BLOOD PH DURING CO-INDUCED HYPOXIA IN THE RAINBOW TROUT. Can. J. Zool. 55 (6): 1010-1013. June 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada] Rainbow trout were exposed to water equilibrated with 5 percent CO and 21 percent O(2) for 30 min. During the exposure dorsal aortic blood pH remained stable at about 8.1 while breathing rate and pressure and heart rate and blood pressure increased. The bradycardia generally associated with environmental hypoxia was absent. It is suggested that the observed circulatory and respiratory responses were not due to acid-base related factors but rather to the stimulation of oxygen receptors. The findings suggest the presence of at least two loci of oxygen-sensitive respiratory control mechanisms in trout.

77-002024 Hurlburt, M. E. EFFECTS OF THYROXINE ADMINISTRATION ON PLASMA THYROXINE LEVELS IN THE GOLDFISH, /CARASSIUS AURATUS/ L. Can. J. Zool. 55 (1): 255-258. Jan. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

77-002025 Ingham, L.; Arme, C. INTESTINAL ABSORPTION OF AMINO ACIDS BY RAINBOW TROUT, /SALMO GAIRDNERI/ (RICHARDSON). J. Comp. Physiol. B Metab. Transp. Funct. 117 (3): 323-334. 1977. SFA 22(4)
[Dep. Zool., Queen's Univ., Belfast, Northern Ireland]

77-002026 Jones, B. C.; Geen, G. H. REPRODUCTION AND EMBRYONIC DEVELOPMENT OF SPINY DOGFISH (/SQUALUS ACANTHIAS/) IN THE STRAIT OF GEORGIA, BRITISH COLUMBIA. J. Fish. Res. Board Can. 34 (9): 1286-1292. Sept. 1977. SFA 22(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada]

77-002027 Kalmijn, A. J. THE ELECTRIC AND MAGNETIC SENSE OF SHARKS, SKATES, AND RAYS. Oceanus 20 (3): 45-52. 1977. SFA 22(4)
[Woods Hole Oceanogr. Inst., Woods Hole, MA]

77-002028 Kavaliers, M.; Abbott, F. S. RHYTHMIC COLOUR CHANGE OF THE KILLIFISH, /FUNDULUS HETEROCLITUS/. Can. J. Zool. 55 (3): 553-561. Mar. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] A photoelectric method was developed to continuously record the colour of /Fundulus heteroclitus/. Subsequent recording revealed the existence of an endogenous rhythm of colour change with a period of 22 h 30 min to 26 h 30 min, and an amplitude of 2.5 Ostwald units. Light-dark cycles had a masking rather than entraining effect on colour change. Temperature-salinity alterations were also ineffictive in entrainment. Blinding the fish did not affect the rhythm. Hypophysectomy extinguished the rhythm of colour change, but did not affect the ability to adapt to different backgrounds.

77-002029 Kitahara, T.; Saito, K. [BIOCHEMICAL STUDIES OF CAROTENOIDS IN THE CHUM SALMON (/ONCORHYNCHUS KETA/) DURING UP-STREAM MIGRATION FOR SPAWNING--V. BEHAVIOR OF CAROTENOIDS IN THE KOKANEE (/O. NERKA/) WITH THE ADVANCEMENT OF MATURATION.] Sci. Rep. Hokkaido Salmon Hatchery No. 31: 29-36. 1977. In Japanese with English summ. SFA 22(4)
[Otaru Univ. Commerce, Otaru, Japan]

77-002030 Kitay, D. S.; Westfall, T. C. DOSE RELATED EFFECT OF METHALLIBURE (ICI 33,828), /IN VITRO/, UPON HYPOTHALAMIC CATECHOLAMINE UPTAKE IN THE TELEOST, /POECILIA LATIPINNA/. Gen. Comp. Endocrinol. 31 (4): 402-406. Apr. 1977. SFA 22(4)
[Dep. Pharmacol., Univ. Va. Sch. Med., Charlottesville 22903]

77-002031 Kobayashi, K.; Kimura, S.; Shimizu, E. STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH--IX. ISOLATION AND IDENTIFICATION OF PENTACHLOROPHELYL-BETA-GLUCURONIDE ACCUMULATED IN BILE OF GOLDFISH. Bull. Jpn. Soc. Sci. Fish. 43 (5): 601-607. May 1977. SFA 22(4)
[Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka, Japan]

77-002032 Krivobok, M. N.; Shatunovskiy, M. I. INFLUENCE OF GONAD MATURATION ON OTOLITH WEIGHT INCREASE IN THE BALTIC COD, /GADUS MORHUA CALLARIAS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 408-414. 1976. SFA 22(4)
[VNIRO, Moscow, USSR] The weight increase in the otoliths of the Baltic cod, /Gadus morhua callarias/, reflects all the synthetic processes occurring in the organism. The first period of otolith weight increase reflects the precesses of protein and lipid synthesis, occurring during the growth period of the individual. The second otolith weight increment occurs during resorption of the protein and lipids of the body and liver of the cod and coincides in time with the phase of intensive development of the gonads. This type of growth is absent in immature fish and in mature fish that fail to spawn. In them the weight of the otoliths is the same in spring as in the previous autumn. In the Baltic cod a considerable increase in angular coefficients was observed in the equation of the theoretical line of otolith weight regression onto the length of the fish with the increase in age.

77-002033 Larsson, A.; Fange, R. CHOLESTEROL AND FREE FATTY ACIDS (FFA) IN THE BLOOD OF MARINE FISH. Comp. Biochem. Physiol. B Comp. Biochem. 57 (3): 191-196. 1977. SFA 22(4)
[Dep. Zoophysiol., Univ. Goteborg, Fock, S-400 33 Goteborg, Sweden] The contents of cholesterol and free fatty acids (FFA) in blood plasma were examined in 22 species of marine fishes caught in the Skagerrak and representing various groups of fishes (Cyclostomi, Holocephali, Elasmobranchii and Teleostei). The cholesterol level in most fishes, except elasmobranchs, was 2-6 times higher than that of higher vertebrates. In the majority of examined fish species 65-75 percent of the plasma cholesterol was in esterified form. A seasonal variation in plasma cholesterol, probably associated with spawning, was found in the teleosts /Gadus virens/ and /Gadus morrhua/. The plasma FFA level, which showed great interspecies variation, seemed to be dependent both on storage sites of lipid reserves and on the activity of the fish species. Various factors affecting the blood plasma levels of cholesterol and FFA in fish are reviewed.

77-002034 Leatherland, J. F.; Bekolay, R.; McLean, R. S.; Brown, D. PITUITARY CONTROL OF PIGMENTATION IN XANTHIC, MOOR, AND WHITE /CARASSIUS AURATUS/ L. Can. J. Zool. 55 (2): 456-464. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

77-002035 Leis, J. M. DEVELOPMENT OF THE EGGS AND LARVAE OF THE SLENDER MOLA, /RANZANIA LAEVIS/ (PISCES, MOLIDAE). Bull. Mar. Sci. 27 (3): 448-466. July 1977. SFA 22(4)
[Hawaii Inst. Mar. Biol., Univ. Hawaii, P.O. Box 1346, Kaneohe 96744] The development of /Ranzania laevis/ is described and illustrated from eggs and larvae collected in Hawaiian waters. Eggs were reared in the laboratory. The eggs are spherical, 1.42-1.66 mm in diameter, possess 20-30 oil droplets and hatch in 7 to 8 days. The newly hatched larvae lack body spines but develop them within 2 days. The spines grow rapidly and reach maximal development at about the time of ossification of the medial fin rays and are then either resorbed or shed. Young larvae have a well developed notochord, finfold, and post-anal myomeres; these atrophy during development. The clavus (pseudocaudal) rays form starting from the terminus of the dorsal and anal fins and close the gap inward. An ossified caudal complex homologous to that of more typical teleosts does not form. The eggs can be distinguished from all others in Hawaiian waters by size, oil droplets, and pigmentation. The larvae can be distinguished by shape, pigmentation, and later by spination. The apparent spawning season in Hawaii extends from January through early May. Both eggs and larvae are more abundant along northern coasts than along southern coasts of the Hawaiian Islands studied.

77-002036 Marliave, J. B. EFFECTS OF THREE ARTIFICIAL LIGHTING REGIMES ON SURVIVAL OF LABORATORY-REARED LARVAE OF THE SAILFIN SCULPIN. Prog. Fish-Cult. 39(3): 117-118. July 1977. SFA 22(4)
[Vancouver Public Aquarium, P.O. Box 3232, Vancouver, BC V6B 3X8, Canada]

77-002037 Mazeaud, M. M.; Mazeaud, F.; Donaldson, E. M. PRIMARY AND SECONDARY EFFECTS OF STRESS IN FISH: SOME NEW DATA WITH A GENERAL REVIEW. Trans. Am. Fish. Soc. 106 (3): 201-212. May 1977. SFA 22(4)
[Inst. Oceanogr., 195, Rue Saint-Jacques, 75005 Paris, France]

77-002038 McCormick, J. H.; Jones, B. R.; Hokanson, K. E. F. WHITE SUCKER (/CATOSTOMUS COMMERSONI/) EMBRYO DEVELOPMENT, AND EARLY GROWTH AND SURVIVAL AT DIFFERENT TEMPERATURES. J. Fish. Res. Board Can. 34 (4): 1019-1025. July 1977. In English with French summ. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804]

77-002039 Mears, H. C.; Eisler, R. TRACE METALS IN LIVER FROM BLUEFISH, TAUTOG AND TILEFISH IN RELATION TO BODY LENGTH. Chesapeake Sci. 18 (3): 315-318. Sept. 1977. SFA 22(4)
[NMFS, Federal Bldg., 14 Elm St., Gloucester, MA 01930] Livers from bluefish, tilefish and tautog collected during the summer of 1971 off the New Jersey coast were analyzed for Cd, Cr, Cu, Fe, Mn, Ni, and Zn by atomic absorption spectrophotometry. Liver ash from male and female tautog contained decreasing concentrations of Ni with increasing body length. Smaller males also contained greater levels of Cr and Cu in liver than larger tautogs. Larger tilefish contained proportionately more Cd, Cu, and Fe in liver than smaller tilefish. Decreasing levels of Mn and Zn with body length were apparent only for females. Livers from larger male bluefish were associated with higher concentrations of Fe than those from smaller males, while those from larger females contained lower concentrations of Cr than those from smaller females. The data suggest that future comparisons for trace metals which vary as a function of size be made only among fish of the same length.

77-002040 Mishra, N.; Pandey, P. K.; Datta Munshi, J. S.; Singh, B. R. HAEMATOLOGICAL PARAMETERS OF AN AIR-BREATHING MUD EEL, /AMPHIPNOUS CUCHIA/ (HAM.) (AMPHIPNOIDAE; PISCES). J. Fish Biol. 10 (6): 567-573. June 1977. SFA 22(4)
[Post. Grad. Dep. Zool., Bhagalpur Univ., Bhagalpur-812007, Bihar, India]

77-002041 Murai, T.; Andrews, J. W. EFFECTS OF SALINITY ON THE EGGS AND FRY OF THE GOLDEN SHINER AND GOLDFISH. Prog. Fish-Cult. 39 (3): 121-122. July 1977. SFA 22(4)
[Univ. Ga. Agric. Exp. Stn., P.O. Box 13687, Savannah 31406]

77-002042 Nagahama, Y.; Clarke, W. C.; Hoar, W. S. INFLUENCE OF SALINITY ON ULTRASTRUCTURE OF THE SECRETORY CELLS OF THE ADENOHYPOPHYSEAL PARS DISTALIS IN YEARLING COHO SALMON (/ONCORHYNCHUS KISUTCH/). Can. J. Zool. 55 (1): 183-198. Jan. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Univ. British Columbia, Vancouver, BC, Canada] Six different types of secretory cells were identified by light and electron microscopy in the adenohypophyseal pars distalis of yearling coho salmon acclimated to fresh or salt water. Prolactin cells are markedly more active in the freshwater than the seawater fish; these cells exhibit definite functional activity 3 days after transfer from salt to fresh water, indicating an osmoregulatory role of prolactin in the freshwater environment. Plasma sodium showed a significant decline 6 h after transfer from sea water to fresh water and, even after 1 week, remained lower than in the fully acclimated freshwater fish. Corticotropic (ACTH) cells did not appear cytologically different in freshwater and seawater fish. GH cells, the most prominent cells in

77-002042 CONTINUED
the proximal pars distalis, appear more numerous and more granulated in the seawater fish, suggesting an osmoregulatory involvement in young coho salmon. Putative thyrotropic (TSH) and putative gonadotropic cells (GTH) can be distinguished by differences in granulation; only one type of GTH cell is evident with ultrastructural features that differ from those of sexually mature salmon. Stellate, non-granulated cells occur in all regions of the adenohypophysis but more frequently in the prolactin follicles; they are much more prominent in the seawater than freshwater fish.

77-002043 Nagai, M.; Iriki, M. CHARACTERISTICS OF HEART RATE RESPONSES ELICITED BY THERMAL STIMULATION OF THE SPINAL CORD OF THE CARP, /CYPRINUS CARPIO/. Comp. Biochem. Physiol. A Comp. Physiol. 57 (4): 417-421. 1977. SFA 22(4)

[Dep. Physiol., Tokyo Metro. Inst. Gerontol., 35-2, Sakaecho, Itabashiku, Tokyo-173, Japan] Heart rates with spinal cord thermal stimulation were measured in restrained, unanaesthetized carp at 26, 20 and 15°C ambient water temperatures. Heart rate was increased by spinal warming and decreased by colling; there was a linear correlation between spinal temperature and peak heart rate values. The heart rate response was linearly augmented as the intensity of stimulation was increased, and this linear regression showed the most steep gradient at 20°C ambient water temperature.

77-002044 Nesterenko, N. A. SURVIVAL OF /COREGONUS PELED/ LARVAE IN DIFFERENT SALINITIES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 473-477. 1976. SFA 22(4)

[Sibrybniiproyekt, Novosibirsk, USSR] The results of experiments on the survival of 1, 7 and 14 day old larvae of /Coregonus peled/ in 2-12°/oo salinity are given. It was established that a salinity of more than 8°/oo is lethal to all larvae, independent of age. At a salinity of less than 8°/oo larvae 24 hours old have the highest rate of survival. Practical recommendations are given on the use of saline waters for the rearing of pelyad.

77-002045 Nishikawa, K. [INFLUENCE OF METHYLTESTOSTERONE ON THE THYROID GLAND OF THE MEDAKA, /ORYZIAS LATIPES/.] Bull. Fac. Fish. Hokkaido Univ. 27 (3-4): 121-128. Dec. 1976. SFA 22(4)

[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

77-002046 Northcutt, R. G. ELASMOBRANCH CENTRAL NERVOUS SYSTEM ORGANIZATION AND ITS POSSIBLE EVOLUTIONARY SIGNIFICANCE. Am. Zool. 17 (2): 411-449. 1977. SFA 22(4)

[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109] Examination of shark brain:body ratios reveals that these taxa possess relative brain volumes in a range overlapping those of bony fish as well as birds and mammals. Much of the variation is due to relative development of the telencephalon and cerebellum. Telencephalic weights vary from 24 percent in /Squalus/ to 52 percent in /Sphyrna/. Analysis of the cytoarchitectonics of the shark brain reveals at least two patterns of development. Squalomorph sharks possess low brain-body ratios, and the telencephalon of these taxa possess well developed lateral ventricles and poorly developed pallial areas. The diencephalon is characterized by prominent periventricular laminae, and the cerebellum lacks foliation. The lamniform and carcharhiniform sharks are characterized by high brain:body ratios, and there is marked hypertrophy of the telencephalon. The roof (Pallial) regions, as well as the diencephalon, are characterized by extensive cellular migrations. The cerebella of these forms possess extensive complex foliation. These

77-002046 CONTINUED
brain patterns are compared with the brain organization of Holocephali, and I conclude that the holocephalans are a sister radiation of the elasmobranchs. Comparisons with bony fish and land vertebrates suggest that elasmobranchs have independently developed complex pallial fields and cerebellar foliation as a result of parallel evolutionary trends.

77-002047 Northmore, D. P. M. SPATIAL SUMMATION AND LIGHT ADAPTATION IN THE GOLDFISH VISUAL SYSTEM. Nature 268 (5619): 450-451. 4 Aug. 1977. SFA 22(4)
[Inst. Neurosci. Behav., Univ. Del., Newark 19711]

77-002048 Orimo, H.; Yamauchi, H.; Ohyama, T.; Matuo, M.; Otani, M. RADIOIMMUNOASSAY AND IMMUNOLOGICAL PROPERTIES OF EEL CALCITONIN. Gen. Comp. Endocrinol. 31 (4): 482-485. Apr. 1977. SFA 22(4)
[Dep. Endocrinol., Tokyo Metro. Geriatric Hosp., Itabashi, Tokyo, Japan]

77-002049 Ota, T.; Takagi, T. A COMPARATIVE STUDY ON THE LIPID CLASS COMPOSITION AND THE FATTY ACID COMPOSITION OF SWEET SMELT, /PLECOGLOSSUS ALTIVELIS/, FROM MARINE AND FRESH-WATER HABITAT. Bull. Fac. Fish. Hokkaido Univ. 28 (1): 47-56. Apr. 1977. SFA 22(4)
[Lab. Chem. Fish Oil, Fac. Fish., Hokkaido Univ., Japan]

77-002050 Pandey, S.; Lam, T. J.; Nagahama, Y.; Hoar, W. S. EFFECTS OF DEXAMETHASONE AND METOPIRONE ON OVULATION IN THE GOLDFISH, /CARASSIUS AURATUS/. Can. J. Zool. 55 (8): 1342-1350. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Patna Univ., Patna-800005, India]

77-002051 Pang, P. K. T.; Griffith, R. W.; Atz, J. W. OSMOREGULATION IN ELASMOBRANCHS. Am. Zool. 17 (2): 365-377. 1977. SFA 22(4)
[Dep. Pharmacol. Ther., Texas Tech Univ. Health Sci. Cent., Lubbock 79409] Osmoregulatory mechanisms were examined in major groups of fishes including hagfish, holocephalans, elasmobranchs, the coelacanth, and ray-fin fishes. Four main patterns of body fluid composition emerged. These represent the three main osmoregulatory processes in the marine environment and the one in fresh water. Some possible interrelationships among these four types are discussed. Urea retention in marine elasmobranchs and the coelcanth, although similar, may have been acquired independently during evolution. The importance of gills and the rectal gland in elasmobranch osmoregulation is discussed. The importance of amino acids in intracellular osmoregulation in elasmobranchs is also reviewed. Recent studies on water and electrolyte regulation in freshwater stingrays are summarized.

77-002052 Payan, P.; Pic, P. ORIGINE DE L'AMMONIUM EXCRETE PAR LES BRANCHIES CHEZ LA TRUITE (/SALMO GAIRDNERI/). [ORIGIN OF AMMONIA EXCRETED BY THE TROUT GILL (/SALMO GAIRDNERI/).] C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat. 284 (24): 2519-2522. 27 June 1977. In French with English summ. SFA 22(4)
[Dep. Biol. C.E.A., Stn. zool., 06230 Villefranche-sur-Mer, France] In the perfused head of Trout the gills are the site of ammonia clearance which corresponds exactly to the appearance rate of ammonia in the external medium. Thus metabolic production of ammonia by the

77-002052 CONTINUED
gill apparently does not participate to its excretion. Under ammonia-free Ringer perfusion however, endogenous production is observed and ammonia is excreted in both external and internal media.

77-002053 Pickering, A. D. SEASONAL CHANGES IN THE EPIDERMIS OF THE BROWN TROUT /SALMO TRUTTA/ (L.). J. Fish Biol. 10 (6): 561-566. June 1977. SFA 22(4)
[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Nr. Ambleside, Cumbria, England] A sexual dimorphism was found in the epidermis of hatchery-reared brown trout. The epidermis of both male and female fish undergoes rhythmical changes in thickness during successive spawning cycles. For most of the year the male has a significantly thicker epidermis than the female. During the spawning period (December and January) there is a highly significant drop in the concentraion of mucous cells in the epidermis of the male brown trout. These findings are discussed in the light of our knowledge of the skin structure in other salmonid fish and in relation to possible hormonal factors influencing the epidermis of teleosts.

77-002054 Pickford, G. E.; Strecker, E. L. THE SPAWNING REFLEX RESPONSE OF THE KILLIFISH, /FUNDULUS HETEROCLITUS/: ISOTOCIN IS RELATIVELY INACTIVE IN COMPARISON WITH ARGININE VASOTOCIN. Gen. Comp. Endocrinol. 32 (2): 132-137. June 1977. SFA 22(4)
[Dep. Biol., Hiram, Coll., Hiram, OH 44234]

77-002055 Ronnau, K.-C. MYOGENESIS AND CONTRACTION IN THE EARLY EMBRYONIC HEART OF THE RAINBOW TROUT. AN ELECTRON MICROSCOPIC STUDY. Cell Tissue Res. 180 (1): 123-132. 1977. SFA 22(4)
[Zool. Inst. Justus Liebig, Univ. Giessen, West Germany]

77-002056 Santerre, M. T.; May, R. C. SOME EFFECTS OF TEMPERATURE AND SALINITY ON LABORATORY-REARED EGGS AND LARVAE OF /POLYDACTYLUS SEXFILIS/ (PISCES: POLYNEMIDAE). Aquaculture 10 (4): 341-351. Apr. 1977. SFA 22(4)
[Hawaii Inst. Mar. Biol., P.O. Box 1346, Kaneohe 96744] Effects of temperature and salinity on eggs and yolksac larvae of /Polydactylus sexfilis/ (Cuvier and Valenciennes) were examined in laboratory experiments. Data on developmental rates as influenced by temperature are presented. Larval length at 95 percent yolksac absorption was maximized between 23.8 and 28.6°C. Based on the development of functional eyes and jaws, larvae were judged capable of feeding before the yolk was completely absorbed. Larvae incubated at intermediate temperatures also had larger amounts of yolk remaining when eyes and jaws were judged functional. Temperature and salinity effects on hatching success, survival at the end of the yolksac stage, and morphological abnormalities were studied in a 10 x 5 (temperature x salinity) array of treatments. In 34°/oo sea water, normalized larval survival at the end of the yolksac stage was greater than 50 percent between temperatrues of 21.9 and 28.0°C. Larval survival decreased at lower temperatures and salinities. Proportions of abnormal larvae increased at temperature and salinity extremes, and normal development was maximized between 26 and 34°/oo. Larvae (74 h after fertilization) were more tolerant to extreme high temperatures than were newly fertilized eggs. Upper salinity tolerance limits of 42-h larvae were greater at 26.2°C than at 23.5 or 29.2°C, and lower salinity was less tolerated at the two extreme temperatures. Based on the results, recommended temperatures and salinities for rearing /P. sexfilis/ eggs and early larvae are 24-28°C and 26-34°/oo.

77-002057 Savina, M. V.; Wojtczak, A. B. ENZYMES OF GLUCONEOGENESIS AND THE SYNTHESIS OF GLYCOGEN FROM GLYCEROL IN VARIOUS ORGANS OF THE LAMPREY (/LAMPETRA FLUVIATILIS/). Comp. Biochem. Physiol. B Comp. Biochem. 57 (3): 185-190. 1977. SFA 22(4)

[A. B. Wojtczak: Dep. Cell. Biochem., Nencki Inst. Exp. Biol., Pasteura 3, 02-093, Warsaw, Poland] The content of glycogen and ATP is strongly decreased in lamprey liver but remains unchanged in somatic muscles during the spawning migration. Lamprey somatic muscles and the heart contain highly active glycerol-3-phosphate dehydrogenase and glycerol kinase. [^{14}C] Glycerol is rapidly incorporated into glycogen in lamprey muscles both /in vivo/ and in slices. The incorporation into liver glycogen is very slow /in vivo/ and none in slices. Although pyruvate carboxylase and phosphoenolpyruvate carboxykinase are present in liver, it seems unlikely that gluconeogenesis proceeds in this organ during spawning migration. The results suggest that muscles are the main site of gluconeogenesis in the migrating lamprey and that glycerol is an important precursor.

77-002058 Schreck, C. B.; Scanlon, P. F. ENDOCRINOLOGY IN FISHERIES AND WILDLIFE: BIOLOGY AND MANAGEMENT. Fisheries (Bull. Am. Fish. Soc.) 2 (3): 20-27,30. May-June 1977. SFA 22(4)

[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis]

77-002059 Schubel, J. R.; Smith, C. F.; Koo, T. S. Y. THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF LARVAL FISHES: A LABORATORY ASSESSMENT. Chesapeake Sci. 18 (3): 290-298. Sept. 1977. SFA 22(4)

[Mar. Sci. Res. Cent., State Univ. N.Y., Stony Brook 11794] Blueback herring (/Alosa aestivalis/), American shad (/Alosa sapidissima/), and striped bass (/Morone saxatilis/) larvae from the Chesapeake Bay region were subjected in the laboratory to time-excess temperature histories typical of those experienced by organisms entrained by power plants with a variety of design and operating criteria. The maximum excess temperature ranged from 7° to 20°C above the base temperature (the average surface water temperature on the spawning grounds); the time of exposure to a maximum excess temperature from 4 to 60 minutes; and the period of cooling to the final temperature from 60 to 300 minutes. An excess temperature of 20°C resulted in virtually total mortality of larvae of all three species. Striped bass larvae were the most tolerant of the three species and could withstand excess temperatures of up to 10°C with no significant increase in mortality. The response patterns of the other two species were more complicated.

77-002060 Shackley, S. E.; King, P. E. OOEGENESIS IN A MARINE TELEOST, /BLENNIUS PHOLIS/ L. Cell Tiss. Res. 181 (1): 105-128. 1977. SFA 22(4)

[Dep. Zool., Univ. Coll. Swansea, Singleton Park, Swansea, South Wales, U.K. SA2 8PP] Ooegenesis in the oviparous marine teleost, /Blennius pholis/ L., is examined. Eleven developmental stages are identified by ultrastructural observations when changes in the distributions of the organelles and inclusions are described. An exogenous source for the protein yolk precursors is indicated, but less clear is the endogenous contribution. Changes in the follicle epithelium are described together with the formation of the zona which is considered to be follicular in origin. Two types of follicle cell are distinguished and these probably function differently in the process of zona formation. The zona becomes divided into the externa and interna, the later probably resulting from the chemical ordering

77-002060 · CONTINUED
by disulphide bonding of the proteinaceous material of the former.

77-002061 Singh, R.; Raizada, R. B.; Singh, T. P. EFFECTS OF SOME ANTITHYROID DRUGS ON THE PITUITARY-THYROID-GONAD AXIS IN A FRESHWATER CATFISH, /HETEROPNEUSTES FOSSIIIS/ (BLOCH). Gen. Comp. Endocrinol. 31 (4): 451-456. Apr. 1977. SFA 22(4)
[Dep. Zool., Banaras Hindu Univ., Varanasi-221005, India]

77-002062 Sonstegard, R.; Leatherland, J. F.; Moccia, R. THYROID ACTIVITY OF ALEWIVES (/ALOSA PSEUDOHARENGUS/) AND RAINBOW SMELTS (/OSMERUS MORDAX/) IN THE GREAT LAKES. J. Fish. Res. Board Can. 34 (8): 1242-1244. Aug. 1977. In English with French Summ. SFA 22(4)
[Coll. Biol. Sci., Univ. Guelph, Guelph, ON, Canada]

77-002063 Spence, B.; Meier, A. H.; Dietz, T. H. CIRCADIAN CHLORIDE RHYTHMS IN THE GULF KILLIFISH, /FUNDULUS GRANDIS/. Copeia 1977 (3): 557-560. 25 Aug. 1977. SFA 22(4)
[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803] The daily rhythm of plasma chloride concentration in /Fundulus grandis/ ranges from a high of 140 meq/l (1200 h) to a low of 125 meq/l (1600 h). Total body chloride parallels the change in plasma chloride concentration. The results indicate a daily net exchange of chloride between the animal and the medium. The digestive tract may be a major route of chloride loss from the animals.

77-002064 Stanley, J. G.; Fleming, W. R. FAILURE OF SEAWATER-ACCLIMATION TO ALTER OSMOTIC TOXICITY IN /FUNDULUS KANSAE/. Comp. Biochem. Physiol. A Comp. Physiol. 58 (1): 53-56. 1977. SFA 22(4)
[Maine Coop. Fish. Res. Unit, Univ. Me., Orono 04473] The plains killifish /Fundulus kansae/ regulated plasma osmotic concentrations within narrow limits between fresh water and 66°/oo sea water. Freshwater-held fish survived transfer to 38.5°/oo sea water. With gradually increasing salinity, fish could survive in 99°/oo sea water. Freshwater-held fish tolerated plasma osmotic concentrations of about 640 mOsm after transfer to sea water. Fish acclimated to hypersaline sea water (99°/oo) tolerated plasma osmotic concentrations of about 630 mOsm. We conclude that acclimation to sea water does not significantly alter cellular tolerance to high osmotic concentrations.

77-002065 Stanley, J. G. SEASONAL CHANGES IN THE ELECTROLYTE METABOLISM IN THE ALEWIFE, /ALOSA PSEUDOHARENGUS/, IN LAKE MICHIGAN. Proc. Conf. Great Lakes Res. 12: 91-97. 1969. SFA 22(4)
Adult alewives from Lake Michigan were collected during the summer of 1968. Sodium, potassium and calcium levels were determined in serum and tissue samples. Transient hyponatremia was observed in June and July, together with increased sodium content of tissues; suggesting a temporary shift in water or sodium between body fluid compartments. There were no significant changes in potassium levels. Changes in calcium levels during the breeding season suggest deposition of calcium in bone but not in scales. Hypercalcemia was not found in females during the breeding season. The shifts between body fluid compartments may be a contributing factor in the mass mortalities observed in the alewife.

77-002066 Stickney, R. R. CELLULASE ACTIVITY IN THE STOMACHS OF FRESHWATER FISHES FROM TEXAS. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 29: 282-287. 1975[1976]. SFA 22(4)

[Dep. Wildl. Fish. Sci., Texas A&M Univ., College Station 77840] The occurrence of cellulase enzyme activity was examined in the stomachs of Texas fishes representing 26 species. Comparison of the results obtained from enzyme studies with food habits indicated that the two were independent. A hypothesis that the presence of certain enzymes might be correlated with black peritoneum in fish must be rejected with regard to cellulase based on the results of this study. Unlike a previous study in which cellulase activity within species was always either present or absent, seven species examined during the present study were found to exhibit intraspecific differences in cellulase activity. Suggestions for further studies aimed at clarifying the mechanisms of cellulase occurrence and its potential importance to cultured species of fishes are presented.

77-002067 Strand, J. A.; Fujihara, M. P.; Burdett, R. D.; Poston, T. M. SUPPRESSION OF THE PRIMARY IMMUNE RESPONSE IN RAINBOW TROUT, /SALMO GAIRDNERI/, SUBLETHALLY EXPOSED TO TRITIATED WATER DURING EMBRYOGENESIS. J. Fish. Res. Board Can. 34 (9): 1293-1304. Sept. 1977. In English with French summ. SFA 22(4)

[Ecosyst. Dep., Battelle Pac. Northwest Lab., Richland, WA 99352]

77-002068 Strange, J. R.; Kerr, W. E.; Allred, P. M.; Fletcher, D. J. PHOSPHATE INCORPORATION BY DAPHNIDS AND CHANNEL CATFISH IN PHOSPHATE-RICH ENVIRONMENTS. J. Environ. Health A Environ. Sci. Eng. 12 (7): 311-325. 1977. SFA 22(4)

[Cent. Chem. Hazard Assessment, Syracuse Res. Corp., Merrill Lane, Syracuse, NY 13210] A study of the direct incorporation of ^{32}P-labelled phosphate into /Daphnia/ sp. and channel catfish revealed a rapid uptake of phosphate in the Daphnids which peaked at approximately two hours. Following a slight decline in measured radioactivity, the Daphnids maintained a steady level of radioactive phosphate (800 x 10^{3} dpm/mg) during the remaining 48 hours of the experiment. Catfish exposed directly to 10 mCi H(3)^{32}PO(4) in 20 liters of water for two weeks incorporated labelled phosphate in detectable quantities in all tissues examined. Bioconcentration occurred only in heart, brain, liver, and bone; whereas gill, stomach, and kidney activities remained constant. In a bioaccumulation study where ^{32}P-labelled Daphnids were fed to fingerling catfish, ^{32}P appeared to bioaccumulate in the bone, gill, brain, and kidney. Questionable accumulation in the liver and no bioaccumulation in heart, muscle, and stomach was observed.

77-002069 Strange, R. J.; Schreck, C. B.; Golden, J. T. CORTICOID STRESS RESPONSES TO HANDLING AND TEMPERATURE IN SALMONIDS. Trans. Am. Fish. Soc. 106 (3): 213-218. May 1977. SFA 22(4)

[Oreg. Coop. Fish. Res. Unit, Oreg. State Univ., Corvallis 97331]

77-002070 Suyama, M.; Hirano, T.; Okada, N.; Shibuya, T. [QUALITY OF WILD AND CULTURED AYU--I. ON THE PROXIMATE COMPOSITION, FREE AMINO ACIDS AND RELATED COMPOUNDS.] Bull. Jpn. Soc. Sci. Fish. 43 (5): 535-540. May 1977. SFA 22(4)

[Tokyo Univ. Fish., 5-7, Konan 4, Minato-ku, Tokyo 108, Japan] Ayu (sweet smelt), /Plecoglossus altivelis/, is one of the most palatable freshwaterfishes of Japan; however, relatively little is known about the characteristics of taste and flavor though a few preliminary papers have been reported. The present investigation was undertaken to

77-002070 CONTINUED
compare the proximate composition as well as the distribution pattern of free amino acids and their related compounds in wild and cultured ayu. Somewhat remarkable findings attributable to the growing conditions of ayu were obtained. The moisture content of muscle was higher in the wild than in the cultured ayu. The fat content of the former changed during maturation, while the latter contained a large and definite amount of fat. A high ash content was obtained for the viscera of wild ayu. With regard to the free amino acids and related compounds, anserine, glycine, alanine, and lysine occurred in higher quantities in the wild ayu although the concentration of these constituents seemed to differ among the individual specimens.

77-002071 Suzuki, R.; Yamaguchi, M. [EFFECT OF TEMPERATURE ON MATURATION OF A CYPRINID LOACH.] Bull. Jpn. Soc. Sci. Fish. 43 (4): 367-373. Apr. 1977. SFA 22(4)
[Ueda Br. St. Freshwater Fish. Res. Lab., Komaki, Ueda, Nagano, Japan] Based on results, we judge that the critical high temperature for egg maturation of this species is about 30°C and the most suitable, about 25°C, and mature females maintain their full maturity almost all through the year.--From abstr.

77-002072 Takahashi, H. EFFECTS OF LARGE DOSES OF METHYLTESTOSTERONE ON THE DEVELOPMENT OF REPRODUCTIVE ORGANS OF JUVENILE GUPPY, /POECILIA RETICULATA/. Bull. Fac. Fish. Hokkaido Univ. 28 (1): 6-19. Apr. 1977. SFA 22(4)
[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

77-002073 Tondeur, F.; Sargent, J. R. PROPERTIES AND NATURE OF (NA + MG^2)-DEPENDENT ADENOSINE TRIPHOSPHATASE IN THE GILLS OF THE EEL, /ANGUILLA ANGUILLA/ (L.). J. Exp. Mar. Biol. Ecol. 28 (1): 67-76. June 1977. SFA 22(4)
[N.E.R.C. Inst. Mar. Biochem., Aberdeen, Scotland]

77-002074 Tung, T. C.; Niu, M. C. THE EFFECT OF CARP EGG-MRNA ON THE TRANSFORMATION OF GOLDFISH TAIL. Sci. Sin. 20 (1): 59-63. Jan.-Feb. 1977. SFA 22(4)
Poly A attached mRNA was prepared from carp's mature ovarian eggs. When injected into fertilized eggs from different strains of goldfish, it mediated tail transformation from the double to single. The frequency varied according to the strain of goldfish. This discovery provides new information not only supporting but also expanding the previous report that crucian egg-mRNA mediated tail transformation in goldfish.

77-002075 Tung, T. C.; Niu, M. C. ORGAN FORMATION CAUSED BY NUCLEIC ACID FROM DIFFERENT CLASS--URODELE DNA MEDICATED BALANCER FORMATION IN GOLDFISH. Sci. Sin. 20 (1): 56-58. Jan.-Feb. 1977. SFA 22(4)
DNA was isolated from visceral organs of urodele and injected into fertilized eggs of goldfish. Approximately 1 percent of the young fish developed one balancer. From gross and microscopical structures, site of development, and nature of absorption, it resembles the balancer of urodelian species.

77-002076 Vaynberg, Yu. P.; Shagalov, L. B. CHANGES IN THE EXTRACTABILITY OF DNA FROM /ACIPENSER GULDENSTADTI/ MILT BY SODIUM PYROPHOSPHATE IN THE COURSE OF THE SPAWNING MIGRATION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 509-511. 1976. SFA 22(4)
[Inst. Biophys., USSR Minist. Health, Moscow, USSR]

77-002077 Vivekanandan, E. ONTOGENETIC DEVELOPMENT OF SURFACING BEHAVIOUR IN THE OBLIGATORY AIR-BREATHING FISH /CHANNA (=OPHIOCEPHALUS) STRIATUS/. Physiol. Behav. 18 (4): 559-562. Apr. 1977. SFA 22(4)
[c/o Dr. T. J. Pandian, Sch. Biol. Sci., Madurai Univ., Madurai 625021, India]

77-002078 Vivekanandan, E.; Pandian, T. J. SURFACING ACTIVITY AND FOOD UTILIZATION IN A TROPICAL AIR-BREATHING FISH EXPOSED TO DIFFERENT TEMPERATURES. Hydrobiologia 54 (2): 145-160. 1 June 1977. SFA 22(4)
[T. J. Pandian: Sch. Biol. Sci., Madurai Univ., Madurai-625021, India]

77-002079 Walker, R. M.; Johansen, P. H. ANAEROBIC METABOLISM IN GODLFISH (/CARASSIUS AURATUS/). Can. J. Zool. 55 (8): 1304-1311. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada] At 20° goldfish survive anaerobic conditions for only a few hours while at 4°C survival is extended to several days. During the course of low-temperature anaerobiosis there was a rise in blood glucose and lactate, a decline in liver glycogen concentration, and an increase in liver water content, while liver size remained constant. The better cold anaerobic survival of winter and hypophysectomized goldfish compared with spring and sham-operated animals was correlated with greater glycogen stores in the livers of the former. It is concluded that liver glycogen is a necessary energy source during cold anaerobiosis, and it is suggested that the resulting hyperglycemia may represent a mechanism to increase glycolytic energy yield. Cold anaerobiosis also resulted in elevated liver glucose-6-phosphatase (EC 3.1.3.9) activity, suggesting an increase in glycogenolysis, but no change in glycogen phosphrylase (EC 2.4.1.1) activity. While cold anaerobic survival is short term it is possible that liver glycogen may sustain goldfish for longer periods at low oxygen levels through a mixed aerobic-anaerobic metabolism.

77-002080 Walker, R. M.; Johansen, P. H. THE EFFECTS OF HYPOPHYSECTOMY ON LIVER GLYCOGENOLYTIC ENZYMES AND STARVATION RESPONSE IN GOLDFISH (/CARASSIUS AURATUS/ L.). Can. J. Zool. 55 (8): 1297-1303. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada]

77-002081 Wendelaar Bonga, S. E.; Greven, J. A.; Veenhuis, M. VASCULARIZATION, INNERVATION, AND ULTRASTRUCTURE OF THE ENDOCRINE CELL TYPES OF STANNIUS CORPUSCLES IN THE TELEOST /GASTEROSTEUS ACULEATUS/. J. Morphol. 153 (2): 225-244. Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Nijmegen, Nijmegen, The Netherlands]

77-002082 White, B. A.; Henderson, N. E. ANNUAL VARIATIONS IN THE CIRCULATING LEVELS OF THYROID HORMONES IN THE BROOK TROUT, /SALVELINUS FONTINALIS/, AS MEASURED BY RADIOIMMUNOASSAY. Can. J. Zool. 55 (3): 475-481. Mar. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada]

77-002083 Wickelgren, W. O. PHYSIOLOGICAL AND ANATOMICAL CHARACTERISTICS OF RETICULOSPINAL NEURONES IN LAMPREY. J. Physiol. 270 (1): 89-114. Aug. 1977. SFA 22(4)
[Dep. Physiol., Univ. Colo. Med. Sch., Denver 80220]

77-002084 Wickelgren, W. O. POST-TETANIC POTENTIATION, HABITUATION AND FACILITATION OF SYNAPTIC POTENTIALS IN RETICULOSPINAL NEURONES OF LAMPREY. J. Physiol. 270 (1): 115-131. Aug. 1977. SFA 22(4)
[Dep. Physiol., Univ. Colo. Med. Sch., Denver 80220]

77-002085 Wigham, T.; Nashioka, R. S.; Bern, H. A. FACTORS AFFECTING /IN VITRO/ ACTIVITY OF PROLACTIN CELLS IN THE EURYHALINE TELEOST /SAROTHERODON MOSSAMBICUS (TILAPIA MOSSAMBICA). Gen. Comp. Endocrinol. 32 (2): 120-131. June 1977. SFA 22(4)
[Dep. Zool., Univ. Calif., Berkeley 94720]

77-002086 Williams, I. V. PART I. INVESTIGATION OF THE PRESPAWNING MORTALITY OF SOCKEYE IN CHILKO RIVER IN 1971. Int. Pac. Salmon Fish. Comm. Prog. Rep. No. 35. (Part I): 22p. 1977. SFA 22(4)
[Int. Pac. Salmon Fish. Comm., New Westminster, BC, Canada] In most cases of Fraser River sockeye dying prior to spawning, the early part of the spawning migration suffers a higher loss than either the central or late segments. Therefore, sockeye from the early and cnetral segments of the Chilko River population were examined during the spawning migration both in salt and freshwater for differences which could explain this phenomena. Physical parameters, body lipids, blood, plasma cortisol and cortisone and various tissues for histology were sampled. The early fish tended to have higher hematocrits, high plasma cortisol levels, and some gill irritation. Although the number of fish sampled was small, these data do suggest possible areas for further research.

77-002087 Wunder, W. EXPERIMENTELLE UNTERSUCHUNGEN ZUR FRAGE DER REGENERATION DER MAENNLICHEN UND WEIBLICHEN KEIMDRUESEN (GONADEN) BEI DER REGENBOGENFORELLE (/SALMO IRIDEUS/ W. GIBB.). [EXPERIMENTAL INVESTIGATIONS ON THE QUESTION OF REGENERATION OF THE MALE AND FEMALE REPRODUCTIVE GLANDS (GONADES) OF THE RAIN BOW TROUT (/SALMO IRIDEUS/ W. GIBB.).] Zool. Anz. 198 (3-4): 245-262. 1977. In German with English summ. SFA 22(4)
[Zool. Inst., Univ. Erlangen-Nurnberg, West Germany] Rain bow trout 1 1/2 years old and weighing 200 g, which could readily be sexed, were operated under narcosis. Smaller or bigger parts of the gonads on one side or on both sides were removed. In other cases incisions separated the different parts of the gonades into small peaces. The operated fish were marked with numbers and release in a normal fish pond. Half a year later the material was investigated. Result: The removed parts of the gonads did not regenerate. The Remaining parts of the gonades in the fish body showed compensatory hypertrophy. Separated parts of the gonades attained a globular form. Total removal of the gonadal tissue resulted in castration.

77-002088 Yamamoto, Y.; Sato, M.; Ikeda, S. BIOCHEMICAL STUDIES ON L-ASCORBIC ACID IN AQUATIC ANIMALS--IX. EXISTENCE OF DEHYDROASCORBATASE IN CARP HEPATOPANCREAS. Bull. Jpn. Soc. Sci. Fish. 43 (4): 449-453. Apr. 1977. SFA 22(4)
[Dep. Fish., Kyoto Univ., Kyoto, Japan]

77-002089 Yamane, S.; Yamada, J. HISTOLOGICAL CHANGES OF THE ULTIMOBRANCHIAL GLAND THROUGH THE LIFE HISTORY OF THE /MASU/ SALMON. Bull. Jpn. Soc. Sci. Fish. 43 (4): 375-386. Apr. 1977. SFA 22(4)
[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

77-002090 Yoneda, t. [ON AMINO ACIDS IN THE DEVELOPING EGGS OF CHUM SALMON, /ONCORHYNCHUS KETA/.] Bull. Fac. Fish. Hokkaido Univ. 28 (1): 29-39. Apr. 1977. In Japanese with English summ. SFA 22(4)
[Lab. Polymer Chem. Mar. Prod., Fac. Fish., Hokkaido Univ., Japan]

77-002091 Youson, J. H.; Wright, G. M.; Ooi, E. C. THE TIMING OF CHANGES IN SEVERAL INTERNAL ORGANS DURING METAMORPHOSIS OF ANADROMOUS LARVAL LAMPREY /PETROMYZON MARINUS/ L. Can. J. Zool. 55 (2): 469-473. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada] A current scheme for identification of stages in metamorphosis of sea lamprey /Petromyzon marinus/ makes use of external features. Of 13 larvae (Ammocoetes) of anadromous sea lamprey sacrificed before they exhibited the earliest (stage 1) features of metamorphosis, 11 showed differentiation of the adult kidneys, and the beginning of regression of the larval alimentary canal and endostyle. These changes are initiated not more than 1 month nor less than 1 week before known external signs are evident. There is a need for a reexamination and a further description of the early phases of lamprey metamorphosis. Metamorphosis in anadromous sea lamprey provides excellent potential as an experimental system in comparative developmental biology.

77-002092 Zhmurova, Ye. Kh.; Somkina, N. V. THE EFFECT OF SALINITY ON THE EARLY DEVELOPMENT STANZAS OF THE WALLEYE (/LUCIOPERCA LUCIOPERCA/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 511-514. 1976. SFA 22(4)
[AzNIIRKh, Rostov-on-Don, USSR] The rate of the daily weight increase of walleye was at the same level as in the control or higher in all variants of the experiment (salinity between 3.5 and 11°/oo). The highest growth rate was observed in fingerlings kept in water at a salinity of 6°/oo. The mean daily percentage mortality of the fish at salinities between 3.5 and 11°/oo is lower than in fresh water. At an age of 30 days (development stanza E, mean weight 90 mg), juvenile walleye are well able to tolerate salinities between 3.5 and 10°/oo. The best physiological and biochemical indicators were recorded in fingerlings kept in water at a salinity of 6°/oo. This salinity is the optimum for walleye of this age.--Concl.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

77-002093 Beamish, R. J.; Miller, R. R. CYTOTAXONOMIC STUDY OF GILA TROUT, /SALMO GILAE/. J. Fish. Res. Board Can. 34 (7): 1041-1045. July 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

77-002094 Bisson, P. A.; Reimers, P. E. GEOGRAPHIC VARIATION AMONG PACIFIC NORTHWEST POPULATIONS OF LONGNOSE DACE, /RHINICHTHYS CATARACTAE/. Copeia 1977 (3): 518-522. 25 Aug. 1977. SFA 22(4)
[Weyerhaeuser Co., Longview, WA 98632] Relatively little morphological variation exists among populations of longnose dace from the Columbia River Basin. On the other hand, coastal populations from Chehalis River, Umpqua River (/Rhinichthys evermanni) and Coos River exhibit considerable morphological divergence both from each other and from the Columbia stock. Differences shown by samples from the coastal streams suggest that these populations have combinations of characters not shared by other North American representatives.

77-002095 Carpenter, J. W.; Paterson, C. G. VARIATION IN SELECTED MERISTIC SERIES IN THE GOLDEN SHINER, /NOTEMIGONUS CRYSOLEUCAS/ (MITCHILL), IN THE NEW BRUNSWICK-NOVA SCOTIA BORDER REGION. Can. Field-Nat. 91 (1): 74-77. Jan.-Mar. 1977. SFA 22(4)
[Biol. Dep., Mount Allison Univ., Sackville, NB E0A 3C0, Canada] Population of /Notemigomus crysoleucas/ inhabiting five lakes of varying limnological characteristics near the New Brunswick-Nova Scotia border did not show differences in the number of dorsal or pelvic fin rays or in the number of scale rows above the lateral line. One lake in the series, Layton's Lake, supported a population with a significantly lower number of lateral line scales. Population differences in number of anal fin rays could not be related to temperature differences or to differences in other limnological variables and are postulated to result from genetic differences among the populations.

77-002096 Chernenko, Ye. V. GENOME MUTATIONS AMONG EMBRYOS OF THE DIADROMOUS AND RESIDENT SOCKEYE, /ONCORHYNCHUS NERKA/, FROM LAKE DAL'NEYE (KAMCHATKA). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 373-379. 1976. SFA 22(4)
[KoTINRO Petropavlovsk-on-Kamchatka, USSR] The frequency of occurrence of genome mutations (euploid and aneuploid) among 707 blastular embryos obtained from all variants of crossings of the diadromous and resident (kokanee) sockeye, /Oncorhynchsu nerka/, from Lake Dal'neye was studied. With the diploid chromosome number equal to 56 ± 2 the occurrence of mutant embryos in the diadromous form was 1.2 percent, in the resident form 19.8 percent, in hybrids (diadromous female X resident male) 1.0 percent and in hybrids with the participation of the resident female 12.3 percent. The nature of the genome mutations in the embryos of the sockeye and other species of salmonid fishes which, in the author's opinion, is determined by the derivation of the family Salmonidae from a tetraploid ancestor and by the subsequent divergence of karyotypes through chromosomal rearrangements is discussed. The hypothesis is expressed that the increased mutability in progeny of the resident sockeye provides evidence of the unfavorable conditions in Lake Dal'neye for the sexual maturation of females of this form.

77-002097 Copeman, D. G. POPULATION DIFFERENCES IN RAINBOW SMELT, /OSMERUS MORDAX/: MULTIVARIATE ANALYSIS OF MENSURAL AND MERISTIC DATA. J. Fish. Res. Board Can. 34 (8): 1220-1229. Aug. 1977. In English with French Summ. SFA 22(4)
Dep. Chem., Memorial Univ., St. John's, NF, Canada]

77-002098 Foerster, W.; Anders, F. ZYTOGENETISCHER VERGLEICH DER KARYOTYPEN VERSCHIEDENER RASSEN UND ARTEN LEBENDGEBAERENDER ZAHNKARPFEN DER GATTUNG /XIPHOPHORUS/. [CHROMOSOME COMPLEMENTS FROM DIFFERENT SUBSPECIES AND SPECIES OF /XIPHOPHORUS/.] Zool. Anz. 198 (3-4): 167-177. 1977. In German with English summ. SFA 22(4)
[Inst. Humangenet. Justus-Liebig-Univ., Giessen, West Germany] Karyograms are described from the platyfisch /Xiphophorus maculatus/, /X. xiphidium/, /X. variatus/, and from the swordtails /Xiphophorus montezumae cortezi/, /X. helleri strigatus/, /X. helleri guentheri/, and /X. helleri helleri/. The diploid chromosome number of these fishes is 2/n/ = 48. The chromosomes are acrocentric except for the X-chromosom of /X. maculatus/ from Rio Jamapa (Mexico), which is submetacentric. Only this species and /X. xiphidium/ species show morphologically distinguishable sex chromosomes. One pair of the acrocentric chromosomes exhibits a short arm.

77-002099 Gold, J. R.; Avise, J. C. CYTOGENETIC STUDIES IN NORTH AMERICAN MINNOWS (CYPRINIDAE). I. KARYOLOGY OF NINE CALIFORNIA GENERA. Copeia 1977 (3): 541-549. 25 Aug. 1977. SFA 22(4)
[Genet. Sect., Texas A&M Univ., College Station 77843]

77-002100 Hambrick, P. S. THE INTERGENERIC HYBRID, /NOTROPIS CERASINUS/ X /PHOXINUS OREAS/ (PISCES: CYPRINIDAE), IN THE UPPER ROANOKE RIVER DRAINAGE, VIRGINIA. Am. Midl. Nat. 98 (1): 238-243. July 1977. SFA 22(4)
[Rt. 1, Box 185D, Avinger, TX 75630] Four hybrids between the crescent shiner (/Notropis cerasinus/) and the mountain redbelly dace (/Phoxinus oreas/) from the upper Roanoke River Drainage, Virginia, are described. The grand average index of all morphological and meristic characters indicates intermediacy between parental species, although some character values were more extreme than those of the parental species. Hybridization probably resulted from synchronous spawning over /Nocomis/ nests.

77-002101 Kajishima, T.; Takeuchi, I. K. ULTRASTRUCTURAL ANALYSIS OF GENE INTERACTION AND MELANOSOME DIFFERENTIATION IN THE RETINAL PIGMENT CELLS OF THE ALBINO GOLDFISH. J. Exp. Zool. 200 (3): 349-358. June 1977. SFA 22(4)
[Biol. Inst., Fac. Sci., Nagoya Univ., Nagoya 464, Japan]

77-002102 Kirby, R. F.; Thompson, K. W.; Hubbs, C. KARYOTYPIC SIMILARITIES BETWEEN THE MEXICAN AND BLIND TETRAS. Copeia 1977 (3): 578-580. 25 Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Texas, Austin 78712]

77-002103 Medvedeva, E. D. [INTRAPOPULATION VARIABILITY OF CHONDROCRANIUM AND SOME OTHER OSTEOLOGICAL CHARACTERS IN THE GENUS /SALVELINUS/ (SALMONIFORMES, SALMONIDAE) ON THE BERING ISLAND (COMMANDER ISLANDS).] Zool. Zh. 56 (4): 563-575. Apr. 1977. In Russian with English summ. SFA 22(4)

[Dep. Ichthyol., State Univ. Moscow, USSR] The structure of chondrocranium was analyzed in the specimens /Salvelinus alpinus/ (L.) which belonged to the same population but differed in biology. The marked individual, size variability, sexual dimorphism and variability related to sexual maturation were found. The structure of chondrocranium is determined, mainly, by three factors: linear growth of fishes, nuptial changes prior to the spawning and preceding way of life (marine or fresh water).

77-002104 Medvedeva, E. D. [INTRAPOPULATION VARIATION OF SOME SKULL MEMBRANE BONES IN /SALVELINUS ALPINUS/ (SALMONIFORMES, SALMONIDAE) ON THE BERING ISLAND (COMMANDER ISLANDS).] Zool. Zh. 56 (5): 725-735. May 1977. In Russian with English summ. SFA 22(4)

[Dep. Ichthyol., State Univ. Moscow, USSR] The structure of operculum, orbit, supraethmoideum, frontalia and parietalia bones is analyzed in individuals /Salvelinus alpinus/ which differ by the biology, but belong to the same population. A great individual, size, sexual variation and variation related to sexual maturation were found. The structure of bones is subject to changes related to growth, sexual maturation and preceding way of life: that of supraethmoideum and frontalia--to all three types of changes and that of operculum bones--to the two latter only. A conclusion is drawn on the necessity of studying the intrapopulation variation of osteological characters for the determination of their taxonomic value.

77-002105 Menzel, B. W. MORPHOLOGICAL AND ELECTROPHORETIC IDENTIFICATION OF A HYBRID CYPRINID FISH, /NOTROPIS CERASINUS/ X /NOTROPIS C. CORNUTUS/, WITH IMPLICATIONS ON THE EVOLUTION OF /NOTROPIS ALBEOLUS/. Comp. Biochem. Physiol. B Comp. Biochem. 57 (3): 215-218. 1977. SFA 22(4)

[Dep. Anim. Ecol., Iowa State Univ., Ames 50011] Twelve hybrids and 41 specimens of the parental species were collected from a tributary of the James River, VA, U.S.A. Hybrids were intermidiate between the parental species for counts of anterior dorso-lateral and circumferential scales. Several blood protein characters resolved by electrophoresis (plasma, esterases, pre-albumin, transferrin and hemoglobin) showed both parental characteristics in the hybrids. /N. cornutus/ specimens deviated from normal morphological and electrophoretic conditions for the species, and in a fashion indicating introgression from /N. cerasinus/. This supports the hypothesis that /N. albeolus/ arose from /N. cornutus/ stock influenced by genetic and ecological interactions with /N. cerasinus/.

77-002106 Nelson, J. S. EVIDENCE OF A GENETIC BASIS FOR ABSENCE OF THE PELVIC SKELETON IN BROOK STICKLEBACK, /CULAEA INCONSTANS/, AND NOTES ON THE GEOGRAPHICAL DISTRIBUTION AND ORIGIN OF THE LOSS. J. Fish. Res. Board Can. 34 (9): 1314-1320. Sept. 1977. In English with French summ. SFA 22(4)

[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

77-002107 Philipp, D. P.; Whitt, G. S. PATTERNS OF GENE EXPRESSION DURING TELEOST EMBRYOGENESIS: LACTATE DEHYDROGENASE ISOZYME ONTOGENY IN THE MEDAKA (/ORYZIAS LATIPES/). Dev. Biol. 59 (2): 183-197. Sept. 1977. SFA 22(4)
[G. S. Whitt: Dep. Genet. Dev., 515 Morrill Hall, Univ. Ill., Urbana 61801]

77-002108 Reinitz, G. L. ELECTROPHORETIC DISTINCTION OF RAINBOW TROUT (/SALMO GAIRDNERI/), WEST-SLOPE CUTTHROAT TROUT (/S. CLARKI/), AND THEIR HYBRIDS. J. Fish. Res. Board Can. 34 (8): 1236-1239. Aug. 1977. In English with French Summ. SFA 22(4)

77-002109 Reinitz, G. L. INHERITANCE OF MUSCLE AND LIVER TYPES OF SUPERNATANT NADP-DEPENDENT ISOCITRATE DEHYDROGENASE IN RAINBOW TROUT (/SALMO GAIRDNERI/). Biochem. Genet. 15 (5-6): 445-454. June 1977. SFA 22(4)
[U.S. FWS, Diet Develop. Cent., Spearfish, SD]

77-002110 Tsuyuki, H.; Williscroft, S. N. SWIMMING STAMINA DIFFERENCES BETWEEN GENOTYPICALLY DISTINCT FORMS OF RAINBOW (/SALMO GAIRDNERI/) AND STEELHEAD TROUT. J. Fish. Res. Board Can. 34 (7): 996-1003. July 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Vancouver Lab., Vancouver, BC V6T 1X2, Canada]

BEHAVIOR

77-002111 Behrend, K. PROCESSING INFORMATION CARRIED IN A HIGH FREQUENCY WAVE: PROPERTIES OF CEREBELLAR UNITS IN A HIGH FREQUENCY ELECTRIC FISH. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 118 (3): 357-371. 1977. SFA 22(4)
[Univ. Ulm, Abt. Biol. IV, D-7900 Ulm, West Germany]

77-002112 Beitinger, T. L. THERMOPREFERENCE BEHAVIOR OF BLUEGILL (/LEPOMIS MACROCHIRUS/) SUBJECTED TO RESTRICTIONS IN AVAILABLE TEMPERATURE RANGE. Copeia 1977 (3): 536-541. 25 Aug. 1977. SFA 22(4)
[Dep. Biol., North Texas State Univ., Denton 76203] Juvenile bluegill (/Lepomis macrochirus/) acclimated to 25 C occupied a temperature range of 29.5 to 33.1 C in laboratory preference studies. The midpoint of this range, 31.2 C, is considered an estimate of the final temperature preferendum for this species. Experiments were designed to determine 1) the behavioral response of bluegill to situations where available temperatures were either (a) greater or (b) less than their preferendum; and 2) whether a constant temperature approximately either 1 C above or below the limits of the occupied range would influence thermoselection behavior by bluegill. When the temperature preferendum was unavailable, bluegill spent more than 92 percent of their time at the temperature nearest the preferendum. The availability of constant non-preferred temperatures appeared to have little influence on thermoselection behavior: median percent time spent at the two non-preferred temperatures, 28.0 and 34.0 C, were 9.1 percent and 1.3 percent, respectively. In addition, a separate experiment demonstrated that of the two limits of the preferred range, the lower limit is most labile. These findings are related to the thermal ecology of the bluegill.

77-002113 Carr, W. E. S.; Blumenthal, K. M.; Netherton, J. C. III CHEMORECEPTION IN THE PIGFISH, /ORTHOPRISTIS CHRYSOPTERUS/: THE CONTRIBUTION OF AMINO ACIDS AND BETAINE TO STIMULATION OF FEEDING BEHAVIOR BY VARIOUS EXTRACTS. Comp. Biochem. Physiol. A Comp. Physiol. 58 (1): 69-73. 1977. SFA 22(4)
[C. V. Whitney Lab. Exp. Mar. Biol. Med., Rt. 1, Box 121, St. Augustine, FL 32084] In extracts of crab, oyster, sea urchin and mullet, the major stimulants of feeding behavior in the pigfish, /Orthopristis chrysopterus/, were substances of less than /ca./ 1000 mol. wt. Quantitative analyses of betaine and the amino acids were conducted to permit the formulation of synthetic mixtures based on the composition of the four extracts. Synthetic mixtures of betaine and the amino acids could account for most of the stimulatory capacity of extracts of crab, oyster and mullet, but for only a small portion of that of sea urchin extract. Comparative tests of solutions containing betaine and/or the amino acids indicated that response elicitation by a particular extract could be due to one of four types of collaborative effects involving these (or other) substances.

77-002114 Darkov, A. A.; Radokov, D. V.; Saburenkov, Ye. N. NONUNIFORMITY IN THE BEHAVIOR OF FISHES IN SCHOOLS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 514-518. 1976. SFA 22(4)
[IEMEZh AN SSSR, Moscow, USSR]

77-002115 Dill, L. M. REFRACTION AND THE SPITTING BEHAVIOR OF THE ARCHERFISH (/TOXOTES CHATAREUS/). Behav. Ecol. Sociobiol. 2 (2): 169-184. 1977. SFA 22(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] Archerfish (/Toxotes chatareus/) spit droplets of water at aerial insect prey, knocking them onto the water surface to be eaten. Since the fish's eyes remain completely below the water surface during sighting and spitting the fish must deal with potentially severe refraction effects at the air-water interface. High speed (200 f.p.s.) motion picture films of 480 spitting sequences were analyzed to determine the magnitude of the refraction effect and to suggest how the fish compensate for it. /T. chatareus/ do not shoot from a position directly below the prey, but can correctly set their spitting angle to compensate for the refraction unique to a variety of positions. The fish can correct for large refraction effects on the prey's apparent elevation or apparent height. They may be enabled to do so by a rather precise linear relationship between the real elevation of the prey from the nose and the apparent elevation from the eye which exists during sighting and spitting. However, Spitting accuracy decreases with increasing prey height or range. The archerfish must also correct for significant curvature of the water droplet's trajectory. Since shot velocity is relatively constant the fish must make this correction via their spitting angle, but the stage in the spitting process at which this occurs is unknown.

77-002116 Dill, P. A. DEVELOPMENT OF BEHAVIOUR IN ALEVINS OF ATLANTIC SALMON, /SALMO SALAR/, AND RAINBOW TROUT, /S. GAIRDNERI/. Anim. Behav. 25 (1): 116-121. Feb. 1977. SFA 22(4)
[Dep. Biol., St. Francis Xavier Univ., Antigonish, NS B2B 1C0, Canada] The development of behaviour in Atlantic salmon (/Salmo salar/) and rainbow trout (/S. gairdneri/) in a gravel-free environment was observed from hatching to the age corresponding to 1 week after emergence at 15°C (40 days). Records included changes in posture and spatial distribution and the development of swimming, surfacing, ingestive and agonistic behaviour acts. Young fish of both

77-002116 CONTINUED
species with large yolk sacs held a posture and locomoted with their head down, had difficulty in remaining upright, and were essentially photonegative. As the yolk sac was exhausted the body axis became more horizontal, an upright position was maintained, and photonegativity was reduced. Surfacing behaviour occurred just prior to the emergence of conspecifics from gravel. Until the age of emergence, the behaviour of the two species was very similar. Upon emergence, rainbow trout became pelagic and exhibited immediate feeding and extensive agonistic behaviour. Atlantic salmon remained on the substrate after emergence, began to feed at the same age as trout but exhibited less agonistic behavior.

77-002117 Garside, E. T.; Morrison, G. C. THERMAL PREFERENCES OF MUMMICHOG, /FUNDULUS HETEROCLITUS/ L., AND BANDED KILLIFSH, /F. DIAPHANUS/ (LESUEUR), (CYPRINODONTIDAE) IN RELATION TO THERMAL ACCLIMATION AND SALINITY. Can. J. Zool. 55 (7): 1190-1194. July 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada] Frequency distributions corresponding to various levels of thermal acclimation from 5 to 35°C were recorded for samples of marine mummichog, /Fundulus heteroclitus/ L., and samples of freshwater banded killifish, /F. diaphanus/ (LeSeur), in thermal gradients formed in columns of fresh water (less than 0.5°/oo salinity) or sea water (32°/oo salinity). Mean preferred temperatures comprised roughly parallel but irregularly inflected trends for the two series of tests, within each species. In mummichog, preferred temperatures for corresponding thermal acclimations ranged from 3 to 6°C higher in tests conducted in sea water. In banded killifish, preferred temperatures for corresponding thermal acclimations ranged from 5 to 8°C higher in fresh water. Thus, each species regularly preferred higher temperatures in salinity which approximated that of the typical habitat. The inference to be taken is that the unusual salinity for each species places an extraordinary osmoregulative load which influences the reactions of the fish to the series of thermal or other correlated stimuli in the gradient.

77-002118 Garside, E. T.; Heinze, D. G.; Barbour, S. E. THERMAL PREFERENCE IN RELATION TO SALINITY IN THE THREESPINE STICKLEBACK, /GASTEROSTEUS ACULEATUS/ L., WITH AN INTERPRETATION OF ITS SIGNIFICANCE. Can. J. Zool. 55 (3): 590-594. Mar. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada] Thermal preferences were determined in spacious thermal gradients of fresh water and sea water (32°/oo salinity (S)) for acclimations of 5, 15, and 25°C in sea water, for samples of threespine stickleback /Gasterosteus aculeatus/ L. Preferred temperatures increased through acclimations of 5-25°C, with those for the freshwater tests being about 2°C lower at each acclimation. /Final preferenda/ were 16 and 18°C for freshwater tests and seawater tests, respectively. The final preferendum in such haloplastic species is defined as the highest obtainable preferendum that equals acclimation temperature. A later series of disjunct preference determinations in approximately isosmotic water (10.5°/oo S) for subjects acclimated to 7, 15, and 20°C yielded mean values of 17.7, 18.2 and 18.7°C, respectively. A final preferendum has not been designated since the samples were of separate origins. a parallel exists between these responses and the response of this and other haloplastic species in the determination of upper lethal temperatures. The immediate cause appears to be differentials in metabolic loading occasioned by osmoregulative stresses.

77-002119 Gray, R. H.; Genoway, R. G.; Barraclough, S. A. BEHAVIOR OF JUVENILE CHINOOK SALMON (/ONCORHYNCHUS TSHAWYTSCHA/) IN RELATION TO SIMULATED THERMAL EFFLUENT. Trans. Am. Fish. Soc. 106 (4): 366-370. July 1977. SFA 22(4)
[Freshwater Sci., Ecosyst. Dep., Battelle Pac. Northwest Lab., Richland, WA 99352]

77-002120 Gruber, S. H.; Myrberg, A. A., Jr. APPROACHES TO THE STUDY OF THE BEHAVIOR OF SHARKS. Am. Zool. 17 (2): 471-486. 1977. SFA 22(4)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Miami, FL 33149] Many kinds of sharks are dangerous and apparently unpredictable predators whose behavior is virtually unknown. This is because they are difficult both to maintain in captivity and to observe in the field. However, the purpose of this paper is to review the behavioral information on sharks and, more importantly, to suggest approaches which will accelerate progress in understanding the activities of these animals. Shark behavior has been investigated within the methodological framework of both comparative psychology and ethology. Thus the underlying philosophies of these disciplines are briefly discussed. Six approaches for investigating the activities of sharks are presented. Results led to the conclusion that sharks are well adapted to detect and respond appropriately to a wide variety of environmental stimuli. Though the difficulties are real and many, the paper ends on an optimistic note, and it is felt that continued effort will unquestionably lead to a significant increase in our understanding of these fascinating animals.--From abstr.

77-002121 Henderson, D. L.; Chiszar, D. A. ANALYSIS OF AGGRESSIVE BEHAVIOUR IN THE BLUEGILL SUNFISH /LEPOMIS MACROCHIRUS/ RAFINESQUE: EFFECTS OF SEX AND SIZE. Anim. Behav. 25 (1): 122-130. Feb. 1977. SFA 22(4)
[Dep. Psychol., Univ. Colo., Boulder 80302] Two experiments explored the effects of resident and intruder sex (experiment 1) and size (experiment 2) upon aggressive behaviour exhibited by sunfish during 30-min observation sessions. Bluegill sunfish (/Lepomis macrochirus/ Rafinesque) in non-reproductive condition were subjects in both experiments. Residents occupied 95-litre aquaria for 7 days prior to the introduction of an intruder at the start of an observation session. This paradigm allows independent assessment of the effects of both resident-aggressor sex (or size) and intruder-aggressee sex (or size). The first experiment revealed that neither resident sex nor intruder sex exerted significant effects on resident aggressiveness. Experiment 2 showed that large residents exhibited more aggressive responses to both large and small intruders than did small residents. Implications of these findings for perceptual mechanisms underlying the release of bluegill aggression are discussed.

77-002122 Kratt, L. F.; Smith, R. J. F. A POST-HATCHING SUB-GRAVEL STAGE IN THE LIFE HISTORY OF THE ARCTIC GRAYLING, /THYMALLUS ARCTICUS/. Trans. Am. Fish. Soc. 106 (3): 241-243. May 1977. SFA 22(4)
[Dep. Biol., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada]

77-002123 McCauley, R. W.; Elliott, J. R.; Read, L. A. A. INFLUENCE OF ACCLIMATION TEMPERATURE ON PREFERRED TEMPERATURE IN THE RAINBOW TROUT /SALMO GAIRDNERI/. Trans. Am. Fish. Soc. 106 (4): 362-365. July 1977. SFA 22(4)
[Dep. Biol., Wilfrid Laurier Univ., Waterloo, ON N2L 3C5, Canada]

77-002124 McCosker, J. E. FRIGHT POSTURE OF THE PLESIOPID FISH /CALLOPLESIOPS ALTIVELIS/: AN EXAMPLE OF BATESIAN MIMICRY. Science 197 (4301): 400-401. 22 July 1977. SFA 22(4)
[Steinhart Aquarium, Calif. Acad. Sci., San Francisco 94118] When frightened by a predator, the plesiopid fish, /Calloplesiops altivelis/, adopts a posture and appearance that mimics the head of a noxious moray eel, /Gymnothorax meleagris/. Tests indicate that the mimicry is Batesian and not Mullerian. Unlike the strategy of other reef-fish prey species, which hide when threatened, the /Calloplesiop's/ strategy is one of intimidation.

77-002125 Meyer, D. L.; Becker, R.; Graf, W. THE VENTRAL SUBSTRATE RESPONSE OF FISHES. COMPARATIVE INVESTIGATION OF THE VSR ABOUT THE ROLL AND THE PITCH AXIS. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 117 (2): 209-217. 1977. SFA 22(4)
[Inst. Histol. Neuroanat., Univ. Gottingen, Kreuzbergring 36, D-3400 Gottingen, West Germany]

77-002126 Nelson, D. R. ON THE FIELD STUDY OF SHARK BEHAVIOR. Am. Zool. 17 (2): 501-507. 1977. SFA 22(4)
[Dep. Biol., Calif. State Univ., Long Beach 90840] The difficulties of observational study of active, wide-ranging sharks in the relatively concealing natural underwater environment are discussed for both baited and non-baited situations. The possible technique of habituating sharks to the diver's presence is considered in view of the logistical and safety problems imposed by the physical limitations of unaided, unprotected human divers. It is concluded that previous shark-observation methods are inadequate, and that supplementary study techniques must be developed and emphasized. These include remote monitoring by ultrasonic telemetry, telemetry-aided direct observation, and the use of miniature submersibles designed specifically for shark observation.

77-002127 Nursall, J. R. TERRITORIALITY IN REDLIP BLENNIES (/OPHIOBLENNIUS ATLANTICUS/--PISCES: BLENNIIDAE). J. Zool. (Lond.) 182 (2): 205-223. June 1977. SFA 22(4)
[Dep. Zool., Univ. Alberta, Edmonton, AB, Canada] /Ophioblennius atlanticus/ is a shallow-water, surge zone Caribbean species, invariably as adult found in permanent territories on a solid substrate. As such it controls space within a complex community. Planar dimensions of the territories of adults show a mean area of about 0.5 m^2. Antagonistic reactions of different degree are shown to both transgressing and intruding conspecifics, and to a much lesser extent to other species. It is hypothesized that interstitial territories of immature specimens provide the nuclei of future territories. Non-reproductive, extra-territorial activity is not common, but does occur. Evidence is presented to show that dispossessed adult blennies have great difficulty in establishing new territories. Territories that have been vacated are subsequently shared by neighbouring fish. Territory provides space, food and shelter for its resident, and as an occupied, but not impermeable space, it is an agent of control of distribution of Redlip blennies and other species of fish.

77-002128 Rebach, S. SIMULTANEOUS ACTIVITY RECORDING OF MULTIPLE ISOLATED MARINE ORGANISMS IN AN ARTIFICAL SALTWATER RECIRCULATING SYSTEM. J. Fish. Res. Board Can. 34 (9): 1426-1430. Sept. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Univ. Md., East. Shore, Princess Anne 21853]

77-002129 Reutter, J. M.; Herdendorf, C. E. LABORATORY ESTIMATES OF THE SEASONAL FINAL TEMPERATURE PREFFRENDA OF SOME LAKE ERIE FISH. Proc. Conf. Great Lakes Res. 17: 59-67. 1974. SFA 22(4)
[Cent. Lake Erie Area Res., Ohio State Univ., Put-in-Bay]

77-002130 Reynolds, W. W.; Casterlin, M. E. TEMPERATURE PREFERENCES OF FOUR FISH SPECIES IN AN ELECTRONIC THERMOREGULATORY SHUTTLEBOX. Prog. Fish-Cult. 39 (3): 123-125. July 1977. SFA 22(4)
[Biol. Dep., Pa. State Univ., Wilkes-Barre 18708]

77-002131 Russock, H. I.; Schein, M. W. EFFECT OF AGE AND EXPERIENCE ON THE FILIAL BEHAVIOUR OF /TILAPIA MOSSAMBICA/ FRY (PISCES: CICHLIDAE). Behaviour 61 (3-4): 276-303. 1977. In English with German summ. SFA 22(4)
[Dep. Biol. Environ. Sci., West. Conn. State Coll., Danbury 06810]

77-002132 Sawa, M. THE AUDIOGRAM OF THE GOLDFISH DETERMINED BY A HEART RATE CONDITIONED METHOD. Bull. Fac. Fish. Hokkaido Univ. 27 (3-4): 129-136. Dec. 1976. SFA 22(4)
[Lab. Physiol. Ecol., Fac. Fish., Hokkaido Univ., Japan] The audiogram of the goldfish was determined by using a change of the conditioned heart rate in a special test tank designed to minimize the near-field effect. A stable acoustic condition was obtained by suspending the fish in a small cage at a fixed position in the test tank. The sensitive frequencies ranged widely from 70 Hz to about 4, 600 Hz, showing the best frequency around 600 Hz where the mean threshold value was -45.6 dB. A gradual rise below 600 Hz and a relatively sharp turn above 800 Hz were indicated in the audiogram. The method presented here seemed to be useful for a rapid determination of the audiogram of fishes.

77-002133 Thomson, K. S.; Simanek, D. E. BODY FORM AND LOCOMOTION IN SHARKS. Am. Zool. 17 (2): 343-354. 1977. SFA 22(4)
[Dep. Biol., Yale Univ., New Haven, CT 06520]

77-002134 Ulvestad, D. A.; Zar, J. H. PREFERRED TEMPERATURE OF THE COMMON SHINER, /NOTROPIS CORNUTUS/, IN RELATION TO AGE, SIZE, SEASON, AND NUTRITIONAL STATE. Ohio J. Sci. 77 (4): 170-173. July-Aug. 1977. SFA 22(4)
[Dep. Biol. Sci., North Ill. Univ., DeKalb 60115] Preferred temperatures were determined in a laboratory temperature gradient for the common shiner /Notropis cornutus/ (Mitchill). Preferred temperature was correlated with age, size, season, and nutritional state. Preferred temperatures were higher than, and positively related to acclimation temperatures in all groups. Age, size, and starvation did not significantly affect the preferred temperature. Significant seasonal differences in preferred temperature were observed with spring-collected fish preferring higher temperatures than autumn-collected fish kept at the same ambient water temperature.

77-002135 Volkova, L. A. THE ROLE OF THE SCHOOL IN THE FORMING OF DEFENSIVE REFLEXES IN THE JUVENILE BAIKAL OMUL, /COREGONUS AUTUMNALIS MIGRATORIUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 485-490. 1976. SFA 22(4)

[Baikal Biol. Stn., Irkutsk Univ., Bol'shiye, USSR] The defensive conditioned reflex in young Baikal omul develops sufficiently distinctly without direct contact with the predator (merely through visual perception) when the larvae are 2 weeks old and 17-19 mm long which coincides with the time of stable school formation.

77-002136 Zaret, T. M. INHIBITION OF CANNIBALISM IN /CICHLA OCELLARIS/ AND HYPOTHESIS OF PREDATOR MIMICRY AMONG SOUTH AMERICAN FISHES. Evolution 31 (2): 421-437. June 1977. SFA 22(4)

[Dep. Zool. NJ-15, Univ. Wash., Seattle 98195]

LIFE HISTORIES-GENERAL WORKS

77-002137 Al-Daham, N. K.; Huq, m. F.; Sharma, K. P. NOTES ON THE ECOLOGY OF FISHES OF THE GENUS /APHANIUS/ AND /GAMBUSIA AFFINIS/ IN SOUTHERN IRAQ. Freshwater Biol. 7 (3): 245-251. June 1977. SFA 22(4)

[Dep. Fish., Univ. Basrah, Basrah, Iraq] The ecology of three commonly occurring cyprinodonts, /Aphanius dispar/ (Ruppell), /A. sophiae/ (Heckel) and /A. mento/ (Heckel) was studied in the Lower Mesopotamian Plain of Iraq. These fishes are chiefly herbivorous, live in the same habitat and generally take the same food, although the dentition of the jaw and pharynx in /A. dispar/ differs from that of /A. mento/ and /A. sophiae/. The gut contents were mostly filamentous algae. In laboratory experiments all three species ate /Gambusia/ embryos. /A. dispar/ and /A. sophiae/ ate mosquito larvae whereas /A. mento/ did not. All three species were infected with a cestode parasite which prevented development of female ovaries. The behaviour of the three species was different. Both /A. dispar/ and /A. sophiae/ form schools, swimming and feeding together. In their natural habitat, males and females of /A. dispar/ were in separate schools. /A. mento/ did not form schools; the males of this species displayed aggressive behaviour. Some observations were also made on /Gambusia affinis/ (Baird & Girard).

77-002138 Atkinson, R. J. A.; Pullin, R. S. V.; Dipper, F. A. STUDIES ON THE RED BAND FISH, /CEPOLA RUBESCENS/. J. Zool. (Lond.) 182 (3): 369-384. July 1977. SFA 22(4)

[Univ. Mar. Biol. Stn., Millport, Isle of Cumbrae, Scotland] The burrows of the Red band fish, /Cepola rubescens/ L. are described from casts taken /in situ/ using polyester resin. Observations of behaviour and spatial distribution are presented and the coloration, morphology, age, gonad condition and diet of captured specimens are discussed.

77-002139 Curtis, M. THE BIOLOGY AND GROWTH OF MONTANA GRAYLING /THYMALLUS ARCTICUS/, IN WYOMING. J. Colo.-Wyo. Acad. Sci. 9 (1) 9. Apr. 1977. — SFA 22(4)
[Dep. Zool., Univ. Wyo., Laramie] Abstract only.

77-002140 Griest, J. R. THE LAKE TROUT OF TWIN LAKES, COLORADO. U.S. Dep. Int. Bur. Reclam. REC-ERC-77-4, ii + 29p. Mar. 1977. SFA 22(4)
[Colo. Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523] Growth, survival, reproduction, recruitment, and food habits of lake trout in Twin Lakes, Colo., were examined during 1974-1975 to document the status of the trout population prior to completion of a 200-megawatt pumped-storage hydroelectric powerplant being constructed on the lake. The powerplant will become operational during 1977, and data collected during this study will be compared to similar data collected during the post-construction period to determine the effect of plant operation on the trout population. Growth of lake trout in Twin Lakes is comparable to that of other lake trout fisheries in the Western United States, such as Lake Tahoe, Nev.-Calif., and Fish Lake, Utah, and is somewhat faster than most lakes located in Canada. Annual mortality was found to be near 50 percent, which compares with other lake trout fisheries of this type. Successful reproduction of lake trout was confirmed by the presence of age classes that had not been stocked. Approximately 90 percent of 4-year-old fish captured during the study were from natural reproduction. Lake trout reaching the legal size limit of 381 mm were usually 4-year-olds, with approximately 20 percent of the population reaching this size each year. Lake trout in Twin Lakes feed primarily on /Mysis relicta/. Chironomid larvae, white suckers, and rainbow trout are also eaten. Possible effects of powerplant operation on the lake trout population are outlined and discussed.

77-002141 Jocque, R. UNE ETUDE SUR /CLARIAS SENEGALENSIS/ VAL. DANS LA REGION DU LAC KOSSOU (COTE D'IVOIRE). [A STUDY ON /CLARIAS SENEGALENSIS/ VAL. IN THE REGION OF LAKE KOSSOU (IVORY COAST).] Hydrobiologia 54 (1): 49-65. 17 May 1977. In French with English summ. SFA 22(4)
[Lab. Oecol., Ledeganekstraat 35-B-9000-gent, Belgium] /Claris senegalensis/ is the dominant silurid of the man-made lake Kossou and some smaller impoundments in the same region. Comparison of data spread over a five year period starting from 1970, some months before the dam was completed, reveals that the density of /C. senegalensis/ dropped to the original level that existed in the river after reaching a peak in the years following the damming. This phenomenon which coincides with the impoverishment of the lake waters, is explained by the fact that /C. senegalensis/ has its optimal habitat in poorly oxygenated waters, rich in organic matter. It is able to colonize this kind of productive waters thanks to the suprabranchial organ. In these optimal conditions it mainly feeds on aquatic insects and plankton. The fecundity of /C. senegalensis/ may reach 200,000 ripening eggs per female. Reproduction occurs during the rainy season in flooded savannas. Growth rates are very high and the age determinations show that, in the region of Kossou, /C. senegalensis/ reaches an average standard length of 620 mm (2.7 kg) within three years. Our results are compared to literature data on other related species of the genus /Clarias/ and the position of /C. senegalensis/ within this generic complex is discussed.

77-002142 Jones, B. C. FEEDING, GROWTH, AND REPRODUCTION OF SPINY DOGFISH (/SQUALUS ACANTHIAS/ L.) IN BRITISH COLUMBIA WATERS. Ph.D. dissertation, Simon Fraser Univ. (Canada) 90p. 1976. From Diss. Abstr. Int. B Sci. Eng. 37(12), 1977. SFA 22(4)

Morphometric ratios, vertebral counts, and electrophoretic analyses of dogfish from east and west coasts of North America indicate that those in the northeastern Pacific Ocean comprise one of several discontinuous stocks of the cosmopolitan species, /Squalus acanthias/ Linnaeus. Ages of dogfish in the Strait of Georgia have been estimated by an X-ray spectrometric technique which involves measuring variations in elemental composition within vertebrae. The results agree well with ages determined by counting dorsal spine circuli. Lengths of dogfish when 50 percent of stock reach maturity are 78.5 and 93.5 cm for males and females respectively. At these lengths males are 19 yr of age and females are 29. Mating occurs from October to January. Males are capable of mating every year. Females mate every second eyar. Ovulation of 4 cm diameter eggs closely follows mating. The fertilized eggs are enclosed in gelatinous capsules for 4 months after which the embryos are released into the uterine cavity. Parturition occurs from September to January, with a peak in November. Gestation is roughly 23 months. A mean of 7.14 progeny are produced per breeding female. Total mortality from parturition to modal length for mature females is 36 percent. The major dietary components based on occurrence were 55 percent teleosts, 35 percent crustaceans, and 5 percent molluscs. The primary food items were herring and euphausids. Estimates of animal consumption varied from five times stock weight for small dogfish to half that for larger animals. In terms of species of importance to commercial fisheries, preliminary analyses suggest that dogfish consume nearly 7 times the current annual catch of herring, but less than 0.1 times the catch of salmon.--From abstr.

77-002143 Kobayashi, T.; Abe, S. [STUDIES ON THE PACIFIC SALMON IN THE YURAPPU RIVER AND VOLCANO BAY 2. ON THE MIGRATION AND THE GROWTH OF THE FRY DURING SEAWARD MIGRATION AND THE RETURN OF MARKED ADULTS.] Sci. Rep. Hokkaido Salmon Hatchery no. 31: 1-11. 1977. In Japanese with English summ. SFA 22(4)

In order to ascertain the result of frozen fresh diets given to the chum fry 208,300 individuals were marked by excising left ventral and adipose fins and as the contrast nonfed fry were marked by cutting both ventral fins using 207,300 individuals. From the result of the recapture of marked fry, it has been observed that the fry after entering into the sea migrate along the coast until about the middle of June toward the outlet of Volcano Bay. On the growth rate of chum fry in the river there is no differnece between the pattern in the upper part and that in the down part. However, it is clear that between the growth pattern in coastal water and that in the river there is a difference. For example the increasing rate in the body weight at coastal water is greater than that in the river. The marked fish released in 1965 returned to the Yurappu River and near the coastal water in 1967-'69 as 3, 4 and 5 year fish, counting 259 in number. Therefore it is concluded that there has been showed a distinct tendency of the adult fish returning to the original place of liberation. Further, it is showed that there is no definite difference between the returning pattern of marked fish group reared by frozen fresh diet and the natural unreared fish group.--From abstr.

77-002144 Luling, K. H. WISSENSCHAFTLICHE ERGEBNISSE DER ARGENTINIEN-SUEDBRASILIEN-EXPEDITION 1970 UND DES FORSCHUNGSAUFENTHALTES DR. K. H. LULING IN ARGENTINIEN 1975: UEBER EINIGE ARGENTINISCHE /CYNOLEBIAS/-ARTEN DER PROVINZ BUENOS AIRES (PISCES, CYPRINODONTIDAE) UND IHR BIOTOP. [SCIENTIFIC RESULTS OF THE ARGENTINE-SOUTHBRASILIAN-EXPEDITION 1970 AND RESEARCH RESIDENCE DR. K. H. LULING IN ARGENTINA 1975: ON SOME ARGENTINE /CYNOLEBIAS/ SPECIES OF THE PROVINCE OF BUENOS AIRES (PISCES, CYPRINODONTIDAE) AND THEIR BIOTOPE.] Zool. Anz. 198 (3-4): 149-166. 1977. In German with English summ. SFA 22(4)
[Mus. Alexander Koenig, Adenaueralle 150-164, D-5300, Bonn, West Germany]

POPULATION STUDIES, PRODUCTION, ETC.

77-002145 Angelier, M.-L. LE PEUPLEMENT PISCICOLE DU RUISSEUA DE LA MOUSQUERE (HAUTES-PYRENEES). [THE FISH POPULATION IN THE STREAM MOUSQUERE.] Ann. Limnol. 12 (3): 299-321. 1976. In French with English summ. SFA 22(4)
[Lab. Hydrobiol., Univ. Paul Sabatier, 118 route de Narbonne, 31077 Toulouse Cedex, France] The trout in the stream Mousquere feed chiefly on invertebrate drift but they also feed relatively on benthic invertebrates, especially larvae of Trichoptera. Terrestrial invertebrates form an important part of the diet, especially in summer. Fish samples were taken in two separate sections of stream. The growth rate is highest in the section with the lowest density. In each age class, the condition factor K is inversely correlated with the population density. The result is that the biomass and annual production are similar in the two sections, and the available food appears to be the limiting factor for population density. There is an inbalance in numbers between young individuals and those aged 3 years or more, the latter are too numerous.

77-002146 Bell, G.; Handford, P.; Dietz, C. DYNAMICS OF AN EXPLOITED POPULATION OF LAKE WHITEFISH (/COREGONUS CLUPEAFORMIS/). J. Fish. Res. Board Can. 34 (7): 942-953. July 1977. In English with French summ. SFA 22(4)
[Dep. Biol., McGill Univ., 1205 McGregor Ave., Montreal, PQ H3A 1B1, Canada]

77-002147 Birman, I. B. MINOR CYCLES IN THE ABUNDANCE DYNAMICS OF SALMON. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 364-372. 1976. SFA 22(4)
[TINRO, Petropavlovsk-Kamchatchey, USSR] The nature of the reasons for the two-year and four-year periodicity observed in the abundance dynamics of the Pacific salmon is examined. The role of the reciprocal influence of year-classes and the adaptive significance of the length of the sexual cycles are demonstrated in this case.

77-002148 Forney, J. L. RECONSTRUCTION OF YELLOW PERCH (/PERCA FLAVESCENS/) COHORTS FROM EXAMINATION OF WALLEYE (/STIZOSTEDION VITREUM VITREUM/) STOMACHS. J. Fish. Res. Board Can. 34 (7): 925-932. July 1977. In English with French summ. SFA 22(4)
[Dep. Nat. Resour., Cornell Univ., Ithaca, NY 14853]

77-002149 George, C. J. THE IMPLICATION OF NEUROENDOCRINE MECHANISMS IN THE REGULATION OF POPULATION CHARACTER OR ON A MORE CHRISTIAN VIEW OF THE BLACK BOX. Fisheries (Bull. Am. Fish. Soc.) 2 (3): 14-19. May-June 1977. SFA 22(4)
[Dep. Biol., Union Coll., Schenectady, NY]

77-002150 Gordon, J. D. M. THE FISH POPULATIONS IN INSHORE WATERS OF THE WEST COAST OF SCOTLAND. THE DISTRIBUTION, ABUNDANCE AND GROWTH OF THE WHITING (/MERLANGIUS MERLANGUS/ L.). J. Fish Biol. 10 (6): 587-596. June 1977. SFA 22(4)
[Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll, Scotland]
The whiting (/Merlangius merlangus/) is an important commercial species from the West Coast of Scotland. This paper describes the distribution, abundance, age composition and growth of juvenile whiting which are found in the inshore areas and sea lochs. No spawning was observed in the areas and it is assumed there was an active migration of whiting from the open sea. They were fisht caught by the bottom trawl in July, reached maximum abundance in November and December and thereafter declined in numbers until few remain by early summer. An exception to this occurs in Loch Etive and possible explanations for the fact that whiting tend to remain for longer periods and grow at a slower rate in this loch are discussed.

77-002151 Johnson, B. G. H. SOME STATISTICS OF THE POPULATIONS OF PARASITIC PHASE SEA LAMPREYS IN CANADIAN WATERS OF THE GREAT LAKES. Proc. Conf. Great Lakes Res. 12: 45-52. 1969. SFA 22(4)
Parasitic-phase sea lampreys, taken in commercial fishing gear, were collected from Great Lakes fishermen with records of the place, date and manner of capture. The catch of sea lampreys per unit of effort was lower in the North Channel than in Lake Huron proper or Georgian Bay, both in 1967 and in 1968, an early indication of the success of sea lamprey control measures recently undertaken in the North Channel. The proportion of male and female sea lampreys taken in the commercial fishery declined markedly in the fall in all areas sampled. Segregation of the sexes could bias those estimates of sea lamprey abundance that are based on evidence of their numbers in the commercial fishery. Rate of growth in length is nearly linear during the fishing season, but a consistent size difference exists between sea lampreys attached to certain different host fishes.

77-002152 Richards, C. E. COBIA (/RACHYCENTRON CANADUM/) TAGGING WITHIN CHESAPEAKE BAY AND UPDATING OF GROWTH EQUATIONS. Chesapeake Sci. 18 (3): 310-311. Sept. 1977. SFA 22(4)
[Va. Inst. Mar. Sci., Gloucester Point 23062] Early summer concentrations discovered by sportfishermen in Chesapeake Bay allowed tagging and release of twenty fish. Six returns were received from sport catches up to five years after release (1,855 days). Sport fishing mortality was 0.30 ± 0.21 with P = 95 percent.

77-002153 Rudenko, G. P. ABUNDANCE OF FISHES AND THEIR FOOD REQUIREMENTS IN LAKE KRIVOYE (PSKOV PROVINCE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 386-397. 1976. SFA 22(4)
[GosNIORKh, Leningrad, USSR] The data on the commercial fish stocks in Lake Krivoye in 1969 and 1972 made it possible to judge the efficiency of the measures taken to regulate the abundance of fish in this body of water and the degree of preparation for fish rearing operations. It was shown that irrespective of the three-year seining of fish of little value, the introduction of walleye and the removal of eggs from artificial spawning grounds, the commercial stocks changed negligibly in the body of water. Consequently, more radical methods of preparing small lakes are essential. The absolute abundance of fish in the lake in 1969 (in its initial state) was established at 22,266 fish/ha, biomass 257 kg/ha. The fish production amounted to 147 kg/ha or 57 percent of the biomass. The study of the food requirements of fish populations together with data on the production of food organisms made it possible to calculate both the quantity of stocked fish and the possible fish production for different types of bodies of water with a different degree of preparation, i.e. to immediately approach the question of controlling the fish production process in natural bodies of water. In this case it was shown that with the complete replacement of native species of little value by more productive valuable species, fish production can be increased by 5 times (from 147 to 750 kg/ha) given future expansion of the polyculture of cultured fish.--From concl.

77-002154 Vinberg, G. G. MARINE BIOLOGY RELATION BETWEEN THE PRODUCTION OF MARINE ANIMALS AND THE "GROWTH" AND "SUPPORTING" PRODUCTIONS. Oceanology 16 (5): 491-498. Apr. 1977. SFA 22(4)
[Inst. Zool., USSR Acad. Sci., Moscow, USSR] The generally accepted method of determining production is carefully analyzed using a numerical example of the size and age composition of a stationary population presented graphically in the form of an "Allen curve" showing the dependence of the numbers of the cohort on the age of the individuals. The same example is used when considering A. N. Golikov's method of calculating the "growth" and "supporting" productions. Each of these two hypothetical values tends to reach the production calculated by the generally accepted methods as the time interval decreases. The "growth" and "supporting" productions vary with the age composition of nonstationary populations. It is concluded that the "age" and "supporting" populations are arbitrary quantities with no particular biological significance. Apart from production, there is no reason for calculating the "growth" (P(g)) and "supporting" (P(s)) populations or such derivatives as the P(g)/P(s) ratio (the "bioenergetic potential", according to Golikov). The latter cannot be used to judge whether a population is thriving or declining or whether it has commercial value.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

77-002155 Baglin, R. E., Jr.; Hill, L. G. FECUNDITY OF THE WHITE BASS, /MORONE CHRYSOPS/ (RAFINESQUE), IN LAKE TEXOMA. Am. Midl. Nat. 98 (1): 233-238. July 1977. SFA 22(4)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149] Fecundity estimates were determined for white bass [/Morone chrysops/ (Rafinesque)] collected from the Red and Washita river arms of Lake Texoma. Mature egg size was evaluated by ovum diameter and condition measurements. Linear regression was used to determine the relationships between fecundity-length, fecundity-weight and fecundity-age. Ovum production

77-002155 CONTINUED
was significantly different between the two spawning populations.

77-002156 Bhatt, V. S.; Dalal, S. G.; Abidi, S. A. H. FECUNDITY OF THE FRESHWATER CATFISHES /MYSTUS SEENGHALA/ (SYKES), /MYSTUS CAVASIUS/ (HAM), /WALLAGONIA ATTU/ (BLOCH) AND /HETEROPNEUSTES FOSSILIS/ (BLOCH) FROM THE PLAINS OF NORTHERN INDIA. Hydrobiologia 54 (3): 219-224. 22 June 1977. SFA 22(4)

[Natl. Inst. Oceanogr., Goa, India] Fecundity of four species of catfishes, namely, /Mystus seenghala/ (Sykes), /Mystus cavasius/ (Ham), /Wallagonia attu (Bloch) and /Heteropneustes fossilis/ (Bloch), was studied. The fecundity of /Mystus seenghala/ and /Mystus cavasius/ varied between 20064 to 46443 and 3314 to 63135 respectively. In /Wallagonia attu/ and /Heteropneustes fossilis/ it varied between 66070 to 453148 and 1375 to 46737 respectively. In all the four species fecundity has a linear relationship with body weight and gonad weight, and a parabolic relationship with length in all the fishes excepting /Mystus seenghala/, where it is linear. By subjecting the data to multiple regression analysis, it is observed that the fecundity of each species can be most accurately determined by taking two variables together. In all the fishes studied the relative fecundity (Egg/body wt.) does not change significantly either with length or body weight.

77-002157 Davis, T. L. O. REPRODUCTIVE BIOLOGY OF THE FRESHWATER CATFISH, /TANDANUS TANDANUS/ MITCHELL, IN THE GWYDIR RIVER, AUSTRALIA. II. GONADAL CYCLE AND FECUNDITY. Aust. J. Mar. Freshwater Res. 28 (2): 159-169. Apr. 1977. SFA 22(4)

[Zool. Dep., Univ. New England, Armidale, N.S.W. 2351, Australia] All male and female /T. tandanus/ in the Gwydir River were mature at age V and at a weight of 1200 g, although some females matured at an earlier age and lower weight than males. The seasonal gonadal cycle as indicated by gonad weight, egg size and maturity stages revealed that the spawning period in the Gwydir River extended from January to the beginning of March. Egg diameter increased linearly with fish length and weight. Ripe eggs ranged from 2.28 to 3.05 mm while fish weight ranged from 675 to 2275 g. Fecundity increased linearly with fish weight and exponentially with fish length. Egg numbers per female ranged from 2000 to 20,600 eggs while fish weight ranged from 675 to 2275 g. Egg size also increased with increasing fecundity. Temperature in excess of 24°C appeared to be the primary factor stimulting spawning. Flooding was not required as a stimulus for spawning.

77-002158 Katz, H. M. CIRCADIAN RHYTHMS, MIGRATION, AND SPAWNING RELATED BEHAVIOR OF THE AMERICAN SHAD, /ALOSA SAPIDISSIMA/ (WILSON). Ph. D. dissertation, Univ. Mass. 227p. 1976. From Diss. Abstr. Int. B Sci. Eng. 37(9), 1977. SFA 22(4)

American shad, /Alosa sapidissima/ (Wilson), migrate upriver from the Atlantic ocean and spawn in the Connecticut River each spring and summer. An exogenous swimming-speed circadian rhythm in young-of-the-year shad is reported. Sixty-two shad were sonic-tagged in 1972 and 1973. Mean upriver migration swimming speeds of 44 cm/s (apparent speed) and 79 cm/s (absolute speed) were measured. Shad move upriver in an irregular pattern, stopping for short periods of time along the way. Shad migrate upriver in both daylight and nighttime. Milling was observed prior, during, and after upriver migration. As water velocities increase, shad swim harder, with an effort that offsets the flow force. This yields an increasing rate of swimming speed with water velocity increases. No differences in swimming speed based on shad length were observable. Fifty-seven percent of the downriver swimming during the upriver migration was attributed to water current.

77-002158 CONTINUED
Sections of river used in the daylight had relatively deep holes. Shad moved out of these locations in the evenings and remained on spawning sites until the early morning hours. Spawning activity and spawning-site selection are believed cued by some parameter other than water velocity. Young-of-the-year shad were placed in an experimental aquarium. Different regimes of light, including a normal day, shifted day, and constant-light level, were imposed upon them. Young shad swam fast and schooled during the photoperiod. Under night conditions these fish swam at about a fifth of the daylight speed and swam either as individuals or in small groups. These shad demonstrated an exogenous rhythm with respect to the imposed day length.--From abstr.

77-002159 Kaya, C. M. REPRODUCTIVE BIOLOGY OF RAINBOW AND BROWN TROUT IN A GEOTHERMALLY HEATED STREAM: THE FIREHOLE RIVER OF YELLOWSTONE NATIONAL PARK. Trans. Am. Fish. Soc. 106 (4): 354-361. July 1977. SFA 22(4)
[Dep. Biol., Mont. State Univ., Bozeman 59715]

77-002160 Marliave, J. B.; DeMartini, E. D. PARENTAL BEHAVIOR OF INTERTIDAL FISHES OF THE STICHAEID GENUS /XIPHISTER/. Can. J. Zool. 55 (1): 60-63. Jan. 1977. In English with French summ. SFA 22(4)
[Lockheed Mar. Biol. Lab., P.O. Box 398, Avila Beach, CA 93424] Egg masses of /Xiphister atropurpureus/ (Kittlitz) and /X. mucosus/ (Girard) are tended by a single adult male wrapped closely around the mass. Males tend up to three egg masses at once. It is suggested that males only tend eggs masses that they have fertilized. Comparison of egg numbers in spawned masses and in ovaries of gravid females, together with the observation of complete egg extrusion by spent females, demonstrates that each mass comprises the entire annual egg output of a female. Therefore, during a season a male may repeatedly spawn with different females.

77-002161 Mayama, H.; Takahashi, T. [ECOLOGICAL OBSERVATION ON THE ADULT SALMON--I. DIURNAL VARIATION OF UPSTREAM MIGRATION OF THE ADULT CHUM SALMON IN THE CHITOSE RIVER.] Sci. Rep. Hokkaido Salmon Hatchery No. 31: 21-28. 1977. In Japanese with English summ. SFA 22(4)
Diurnal variation of upstream migration of the adult chum salmon was observed at the Nishikoshi catching station of the Chitose River, a tributary of the Ishikari River, during October in 1974 and also in 1975. From the observation done four times it became clear that the upstream activity occurred principally in daytime. It is said that a major factor controlling upstream movement is the fluctuation of the water amount discharged from the drainage of the power plants which locate in the upper area of the river.

77-002162 Nordeng, H. A PHEROMONE HYPOTHESIS FOR HOMEWARD MIGRATION IN ANADROMOUS SALMONIDS. Oikos 28 (2-3): 155-159. 1977. In English with Russian summ. SFA 22(4)
[Zool. Inst., Univ. Oslo, Norway] In hypotheses to explain the mechanism of homing in salmon, no directional cues are common for both the open sea navigation and the selection of the home river and area of origin within the river system. The seasonal migration schedules in the anadromous salmonids of the Salangen river system, North Norway are presented. The species are char /Salmo alpinus/ L. (= /Salvelinus alpinus/ (L.)), trout /Salmo trutta/ L. and Atlantic salmon /Salmo salar/ L. Based on their migration schedules, a pheromone hypothesis is proposed for the entire homeward navigation in anadromous salmonids. According to this hypothesis, homeward navigation is an

77-002162 CONTINUED
inherited response to population-specific pheromone trails released from descending smolt. During the downstream migration in spring and summer the smolt descend almost continually into the sea. The pheromones are thought to be released from the skin mucus.

77-002163 Olver, C. H.; Lewis, C. A. REPRODUCTION OF PLANTED LAKE TROUT, /SALVELINUS NAMAYCUSH/, IN GAMITAGAMA, A SMALL PRECAMBRIAN LAKE IN ONTARIO. J. Fish. Res. Board Can. 34 (9): 1419-1422. Sept. 1977. In English with French summ. SFA 22(4)
[Ontario Minist. Nat. Resour., Fish. Br., Toronto, ON M7A 1W3, Canada]

77-002164 Paulson, A. C.; Smith, R. L. LATITUDINAL VARIATION OF PACIFIC HERRING FECUNDITY. Trans. Am. Fish. Soc. 106 (3): 244-247. May 1977. SFA 22(4)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701]

77-002165 Shilov, V. I.; Krasichkova, O. N. [ON SEXUAL MATURATION AND DURATION OF REPEATED MATURATION OF GENITAL PRODUCTS IN /ACIPENSER RUTHENUS/ OF THE VOLGOGRAD WATER RESERVOIR.] Zool. Zh. 56 (6): 894-900. June 1977. In Russian with English summ. SFA 22(4)
[Saratov Br. State Res. Inst. Lake River Fish., Saratov, USSR] The pectoral fin first rays were collected from 519 females during 1960-1973, including 349 females at the IV stage of maturity and 170 females over 50 cm in length at the stages from VI to III. It was established, by the method of Roussow (1957), that the genital products matured once in 369 females, twice in 125, thrice in 18 and four times in 7. The sexual maturation of females is attained at the age of 7 to 20, years (10.4, on the average) and the absolute length of 35 to 85 cm, in the majority at 8-12 years and 42-70 cm. The duration of repeated maturation varies from 3 to 11 years (5-5.9 years, on the average). The age of sexual maturation is not related to the mean indices of duration of repeated maturation and the growth before and after maturation.

77-002166 Siefert, R. E.; Herman, L. J. SPAWNING SUCCESS OF THE BLACK CRAPPIE, /POMOXIS NIGROMACULATUS/, AT REDUCED DISSOLVED OXYGEN CONCENTRATIONS. Trans. Am. Fish. Soc. 106 (4): 376-379. July 1977. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd., Duluth, MN 55804]

77-002167 Tilzey, R. D. J. REPEAT HOMING OF BROWN TROUT (/SALMO TRUTTA/) IN LAKE EUCUMBENE, NEW SOUTH WALES, AUSTRALIA. J. Fish. Res. Board Can. 34 (8): 1085-1094. Aug. 1977. In English with French summ. SFA 22(4)
[N.S.W. State Fish., Sydney, N.S.W., 2000, Australia]

77-002168 Wilkinson, D. R.; Jones, J. W. THE FECUNDITY OF DACE, /LEUCISCUS LEUCISCUS/ (L.) IN EMRAL BROOK, CLWYD, NORTH WALES. Freshwater Biol. 7 (2): 135-145. Apr. 1977. SFA 22(4)
[Fish. Dep. Rivers Div., 48, West Cliff, Preston, Lancashire, England] Estimates of the fecundity of dace were made on 105 mature females using the dry method of Simpson (1959). The reliability of the counting precedure was assessed and found to be satisfactory. Fecundity was examined in relation to fork length (cm), somatic weight (g), ovary weight (g) and age (years). Logarithmic multiple

77-002168 CONTINUED
regressions of fecundity on these variables showed that neither log fork length nor log somatic weight contributed significantly towards explaining the observed variations in fecundity. The best prediction equation for fecundity, incorporated both log ovary weight and log age. Incidents of extensive follicular atresia were found in the ovaries of 19 percent of the female dace examined and the frequency of occurrence of this phenomenon increased with age.

77-002169 Wourms, J. P. REPRODUCTION AND DEVELOPMENT IN CHONDRICHTHYAN FISHES. Am. Zool. 17 (2): 379-410. 1977. SFA 22(4)
[Dep. Zool., Clemson Univ., Clemson, SC 29631]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

77-002170 Clady, M. D. DISTRIBUTION AND ABUNDANCE OF LARVAL CISCOES, /COREGONUS ARTEDII/, AND BURBOT, /LOTA LOTA/, IN ONEIDA LAKE. J. Great Lakes Res. 2 (2): 234-247. Dec. 1976. SFA 22(4)
[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Life Sci. West, Stillwater 74074] Surveys of pelagic fish larvae were made in Oneida Lake, New York, during 1965-1975 with high-speed samplers. In early May, larval ciscoes, /Coregonus artedii/, occurred only above 5.5 m and were actively concentrated near the surface in shallow bays. The largest larvae were found at the shallowest sites and almost half the ciscoes were taken in one small, protected bay. By late May, the larvae had moved offshore, although they remained near the surface. The largest ciscoes were then at the deepest sites. This offshore movement was not strongly related to limnological conditons--water temperature, dissolved oxygen, and food (zooplankton) were similar throughout the upper water column of Oneida Lake at this time--but may have been related to size and water currents. Successive estimates of larval cisco populations suggested that offshore recruitment exceeded total mortality during May. Densities of larval burbot, /Lota lota/, were homogeneous (even at depths greater than 5.5 m) during May. In June, as with ciscoes, greater densities of burbot were found near the surface of the offshore sites. In early May, the largest burbot tended to occur at intermediate depths. Few larval ciscoes or burbot were captured in late June. Populations of larval ciscoes and burbot appear to be disproportionately great in relation to the abundance of adults and may contribute to the persistence of these cold-water species in an eutrophic environment.

77-002171 Dudley, R. G.; Mullis, A. W.; Terrell, J. W. MOVEMENTS OF ADULT STRIPED BASS (/MORONE SAXATILIS/) IN THE SAVANNAH RIVER, GEORGIA. Trans. Am. Fish. Soc. 106 (4): 314-322. July 1977. SFA 22(4)
[Sch. Forest Resour., Univ. Ga., Athens 30602]

77-002172 Gomber, J. HUDSON RIVER STRIPED BASS. Underwater Nat. 10 (3): 27. 1977. SFA 22(4)
[New Jersey Fisherman, Fort Lee]

77-002173 Hanamoto, F. [FISHERY OCEANOGRAPHY OF STRIPED MARLIN--I. FISHING SEASON, FISHING GROUND AND MOVEMENT PATTERN OF THE FISH IN THE SOUTHERN CORAL SEA.] Bull. Jpn. Soc. Sci. Fish. 43 (6): 649-657. June 1977. In Japanese with English summ. SFA 22(4)
[Kanagawa Perfect. Fish. Exp. Stn., Misaki, Miura-shi, Kanagawa-ken, Japan]

77-002174 Leggett, W. C. OCEAN MIGRATION RATES OF AMERICAN SHAD (/ALOSA SAPIDISSIMA/). J. Fish. Res. Board Can. 34 (9): 1422-1426. Sept. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

77-002175 Okata, A. ECOLOGICAL STUDIES ON THE BIOLOGICAL PRODUCTION OF YOUNG AMBERFISH COMMUNITY IN THE SENDAE BAY--IV. SOJOURNING PERIOD OF FISH SCHOOL. Bull. Jpn. Soc. Sci. Fish. 43 (6): 689-699. June 1977. SFA 22(4)
[Fish. Exp. Stn., Ibaraki-Ken, Nakaminato, Japan] Mean sojourning period of young amberfish (/Seriola quinqueradiata/) was estimated in this report for the purpose of grasping its production process in Sendae Bay under limitation in time and space, by means of comparing the duration of daily catch compositions by set-nets, with the aid of the recapture rates obtained by marking experiments. Young amberfish population, migrating in the coastal area, can be regarded as an aggregate which involves several sized fish schools that secure their living in a community while they repeatedly interchange members with one another. During the zenith of fishing, mean sojourning period of schools of the amberfish may be estimated to be the order of 10-20 days. In the course of this examination, it was fairly clarified that each of the marked amberfish gets in a population at random and behaves normally in company with members of fish schools.

77-002176 Peden, A. E.; Edwards, J. C. PERMANENT RESIDENCE IN FRESH WATER OF A LARGE CHUM SALMON (/ONCORHYNCHUS KETA/). Syesis 9: 363. 1976. SFA 22(4)
[British Columbia Prov. Mus., Victoria, BC, Canada]

77-002177 Reynolds, W. W.; Casterlin, M. E. DIEL ACTIVITY IN THE YELLOW BULLHEAD. Prog. Fish-Cult. 39 (3): 132-133. July 1977. SFA 22(4)
[Biol. Dep., Pa. State Univ., Wilkes-Barre 18708]

77-002178 Romberg, G. P.; Spigarelli, S. A.; Prepejchal, W.; Thommes, M. M. MIGRATORY BEHAVIOR OF FISH TAGGED AT A NUCLEAR POWER PLANT DISCHARGE INTO LAKE MICHIGAN. Proc. Conf. Great Lakes Res. 17: 68-77. 1974. SFA 22(4)
[Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL] With the proliferation of nuclear power plants on Lake Michigan, much concern has been expressed over the effects of plume "residence" and abnormal temperature exposures on the physiology and migratory behavior of important fish species. A mark and recapture study was conducted at the Point Beach Nuclear Plant to describe the migratory behavior of fish at this thermal discharge. A total of 1781 fish (seven species) were captured, tagged and released during 1972 and 1973. As of 1 August 1974, 14 percent of the tagged fish have been recaptured, primarily by sport fishermen. Eighty-four percent of the recaptures by fishermen occurred at locations other than Point Beach, and the number of recaptures generally decreased with distance. Rainbow trout tended to be the most migratory, but individuals of each

77-002178 CONTINUED
species showed extensive movements. Experimental temperature-sensitive fish tags indicated that the majority of fish recaptured at Point Beach spent less than 10 percent of their time at discharge temperature. Brown trout exhibited a stronger attraction to discharge waters than did rainbow trout or chinook salmon. High percentages of recapture for most species suggest negligible mortalities due to plume "residence" or the tagging procedure and imply that Lake Michigan sport fishermen are annually harvesting a substantial proportion of the fish stocks.

77-002179 Simms, S. E.; Larkin, P. A. SIMULATION OF DISPERSAL OF SOCKEYE SALMON (/ONCORHYNCHUS NERKA/) UNDERYEARLINGS IN BABINE LAKE. J. Fish. Res. Board Can. 34 (9): 1379-1388. Sept. 1977. In English with French summ. SFA 22(4)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

77-002180 Winter, J. D. SUMMER HOME RANGE MOVEMENTS AND HABITAT USE BY FOUR LARGEMOUTH BASS IN MARY LAKE, MINNESOTA. Trans. Am. Fish. Soc. 106 (4): 323-330. July 1977. SFA 22(4)
[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455]

FOODS AND FEEDING

77-002181 Adamson, S. W.; Wissing, T. E. FOOD HABITS AND FEEDING PERIODICITY OF THE RAINBOW, FANTAIL, AND BANDED DARTERS IN FOUR MILE CREEK. Ohio J. Sci. 77 (4): 164-169. July-Aug. 1977. SFA 22(4)
[Lake Erie Junior Nature Sci. Cent., 28728 Wolf Rd., Bay Village, OH 44140] Stomach analyses were carried out on 3 darter species (/Etheostoma caeruleum/, /E. flabellare/ and /E. zonale/) from Four Mile Creek, Ohio, May 1973-May 1974. These species are mainly insectivorous in this stream. Trichopterans were the most important food type by weight in the diets of /E. caeruleum/ and /E. flabellare/; chironomid larvae and pupae and /Simulium/ sp. dominated the diet of /E. zonale/. Electivity indices indicated a general selection for /Simulium/ sp. and Trichoptera by /E. caeruleum/ and /E. flabellare/, with /E. zonale/ selecting against all trichopterans. Feeding activity of the 3 species was largely confined to the daylight hours, and 2 feeding peaks were generally observed for /E. caeruleum/ and /E flabellare/: one in the morning and the other in late afternoon or early evening. Over a 24 hr period, /E. zonale/ consumed smaller quantities of food than the other species and exhibited no feeding maxima.

77-002182 a-ja; Ishida, T. [FEEDING OF JUVENILE MASU SALMON IN THE STREAM LIFE.] Sci. Rep. Hokkaido Salmon Hatchery No. 31: 13-20. 1977. In Japanese with English summ. SFA 22(4)
Main food item and stomach content index were observed on 119 samples, 1,308 juvenile Masu salmon obtained mainly from the Mena River. A study of feeding activity in Masu salmon was conducted in mid-July, 1975 and 1976, at the Mena River. The amount of food taken in one day was 5.32 in 1975, and 3.75 in 1976. It was observed that the stomach content index changed with amount of drifting organisms, with partial modification by internal physiological rhythm of the fish. Transit rate of food from stomach to intestine varied with the stomach content index. It was found that a considerable amount of moisture was absorbed by the stomach.

77-002183 Brook, I. M. TROPHIC RELATIONSHIPS IN A SEAGRASS COMMUNITY (/THALASSIA TESTUDINUM/), IN CARD SOUND, FLORIDA. FISH DIETS IN RELATION TO MACROBENTHIC AND CRYPTIC FAUNAL ABUNDANCE. Trans. Am. Fish. Soc. 106 (3): 219-229. May 1977. SFA 22(4)
[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, Miami, FL 33149]

77-002184 Donald, D. B.; Kooyman, A. H. FOOD, FEEDING HABITS, AND GROWTH OF GOLDEYE, /HIODON ALOSOIDES/ (RAFINESQUE), IN WATERS OF THE PEACE-ATHABASCA DELTA. Can J. Zool. 55 (6): 1038-1047. June 1977. In English with French summ. SFA 22(4)
[Can. Wildl. Serv., Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada] The feeding habits of goldeye were determined by examining the food items found in 1785 stomachs collected from the Peace-Athabasca Delta, Alterta, in 1971, 1972, and 1973. Larval goldeye fed primarily on Calanoida and Cladocera. Post-larval goldeye fed mainly on Cladocera, Corixidae, and aerial insects but few Calanoida. These young fish selected the larger Cladocera and Calanoida from the planton community. Growth was continuous from June to early September. Yearling and older goldeye had similar feeding habits with Corixidae being the most frequent food item present. They also fed on other aquatic and terrestrial invertebrates and small vertebrates. The food consumed on a given day reflected local as well as seasonal and yearly differences in abundance of the various organisms. Stomachs of these goldeye contained the least amounts of food during July and August. Yearling and fish at least up to age III showed appreciable growth only during June and July.

77-002185 Duka, L. A. FEEDING AND FOOD RELATIONSHIPS OF THE LARVAE AND YOUNG OF THE FAMILY LABRIDAE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 398-407. 1976. SFA 22(4)
[Inst. Biol. South. Seas, Ukrainian SSR Acad. Sci., Sevastopol, USSR] The qualitative composition of the food of Labridae larvae and juveniles varies. Larvae consume the nauplii, metanauplii and copepodite stages of Copepoda in large quantities and also the larvae of molluscs. The main food of the juveniles consists of adult Copepoda. Adult Labradae consume large crustaceans, the settled larvae of molluscs and also plant food together with Harpacticoida. Labridae underyearlings feed more intensively than adults. The indices of fullness of the intestinal tract are higher in females in summer during the reproductive period than in males and immature fish. The closest intraspecific and interspecific food relationships are observed on the basis of the consumption of Harpacticoida, the biomass of which reaches high values in /Cystoseira/ weed beds. This last circumstance gives us reason to believe that the food relationships are not of a competitive nature.--From concl.

77-002186 Dumont, B.; Verneaux, J. EDIFICE TROPHIQUE PARTIEL DU COURS SUPERIEUR D'UN RUISSEAU FORESTIER. [SOME TROPHIC RELATIONSHIPS IN THE UPPER REACHES OF A FOREST STREAM.] Ann. Limnol. 12 (3): 239-252. 1976. In French with English summ. SFA 22(4)
[Univ. Claude-Bernard, Lyon 1, France] One sample of the fish population (October 1972) and three series of samples of invertebrates (January, March and May 1973) were taken in the upper part of a forest brook. Trophic relationships were analysed from a study of the feeding habits of 57 species. The modification of the feeding habits with age, length, time and habitat, and also the general picture of the biological structure, emphasize the complexity of the trophic relationships within this headwater stream with its simple community.

77-002187 Eder, S.; Carlson, C. A. FOOD HABITS OF CARP AND WHITE SUCKERS IN THE SOUTH PLATTE AND ST. VRAIN RIVERS AND GOOSEQUILL POND, WELD COUNTY, COLORADO. Trans. Am. Fish. Soc. 106 (4): 339-346. July 1977. SFA 22(4)
[Mo. Dep. Conserv., Cameron 64429]

77-002188 Foltz, J. W.; Norden, C. R. SEASONAL CHANGES IN FOOD CONSUMPTION AND ENERGY CONTENT OF SMELT (/OSMERUS MORDAX/) IN LAKE MICHIGAN. Trans. Am. Fish. Soc. 106 (3): 230-234. May 1977. SFA 22(4)
[Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309]

77-002189 Harrell, R. M.; Loyacano, H. A., Jr.; Bayless, J. D. ZOOPLANKTON AVAILABILITY AND FEEDING SELECTIVITY OF FINGERLING STRIPED BASS. Ga. J. Sci. 35: 129-135. June 1977. SFA 22(4)
[S. Car. Wildl. Mar. Resour. Dep., P.O. Drawer 170, Bonneau] A study of the importance of zooplankton in the diet of fingerling striped bass, /Morone saxatilis/ (Walbaum), was conducted at the Rembert C. Dennis Wildlife Center in Bonneau, South Carolina. The objectives were to determine the natural food of the fingerlings, the selectivity of feeding, and the extent to which dry pelletized Menhaden meal, /Brevoortia/, was being utilized as a supplemental food. Twenty-six plankton samples and 120 fingerlings were taken from six rearing ponds. The results show that young fingerling striped bass preferentially selected for /Cyclops/ (Copepoda) and /Scapholeberis/ (Cladocera). They were selective against /Bosmina/ (Cladocera), caldoceran egg cases and rotifera. Fish meal was observed as a major item in the stomachs, but selectivity could not be determined.

77-002190 Keast, A. TROPHIC INTERRELATIONSHIPS IN THE FISH FAUNA OF A SMALL STREAM. Proc. Conf. Great Lakes Res. 9: 51-79. 1966. SFA 22(4)
The trophic interrelationships of 12 fish species inhabiting a small stream were investigated over 4 summers, some 8,000 stomachs being analysed. The species separate out ecologically in: 1) habitat specialization; 2) level in water at which food is obtained; 3) major foods--plankton, bottom invertebrate, organic detritus, and piscivorous feeders are present; 4) specialized or generalized feeding; 5) size of food particles eaten and 6) relative biomasses, seasonal movements, consistency and intensity with which the environmental resources are exploited. A high level of "ecological exclusion" is, accordingly, operative. A comparative study of the feeding of the smallest and largest size classes of the fish species shows that typically there is a shift in diet with growth. This usually involves a gradual change in the proportions of the different kinds of foods consumed, and the addition of new types. in /Semotilus/, however, the differences are as great as that between different species. cyclical changes in numbers of the cohabiting invertebrates are defined. Several cases of clearcut correlation between numerical peaks and increased fish feeding are demonstrated for the fauna as a whole and for individual species. The study shows that trophic interrelationships and subdivision of resources within an assemblage of cohabiting fish species is much more subtle and complex than believed by previous reviewers.

77-002191 Kruse, K. C.; Francis, M. G. A PREDATION DETERRENT IN LARVAE OF THE BULLFROG, /RANA CATESBEIANA/. Trans. Am. Fish. Soc. 106 (3): 248-252. May 1977. SFA 22(4)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588]

77-002192 Loftus, W. F.; Lenon, H. L. FOOD HABITS OF THE SALMON SMOLTS, /ONCORHYNCHUS TSHAWYTSCHA/ AND /O. KETA/, FROM THE SALCHA RIVER, ALASKA. Trans. Am. Fish. Soc. 106 (3): 235-240. May 1977. SFA 22(4)
[Res. Div., Everglades Natl. Park, Homestead, FL 33030]

77-002193 Man, H. S. H.; Hodgkiss, I. J. STUDIES ON THE ICHTHYOFAUNA IN PLOVER COVE RESERVOIR, HONG KONG: FEEDING AND FOOD RELATIONS. J. Fish Biol. 11 (1): 1-13. July 1977. SFA 22(4)
[Dep. Bot., Univ. Hong Kong, Hong Kong] The feeding biology of the fish species in Plover Cove Reservoir, Hong Kong has been investigated with special reference to /Sarotherodon mossambicus/ (Peters). The food spectra of various fish species were analysed and compared and the results indicated that /S. mossambicus/ played an important role in the ecology of this reservoir since all major food sources were exploited.

77-002194 Meyer-Rochow, v. B. COMPARISON BETWEEN 15 /CARAPUS MOURLANI/ IN A SINGLE HOLOTHURIAN AND 19 /C. MOURLANI/ FROM STARFISH. Copeia 1977 (3): 582-584. 25 Aug. 1977. SFA 22(4)
[Dep. Biol. Sci., Univ. Waikato, Hamilton, New Zealand]

77-002195 Ross, S. T. PATTERNS OF RESOURCE PARTITIONING IN SEAROBINS (PISCES: TRIGLIDAE). Copeia 1977 (3): 561-571. 25 Aug. 1977. SFA 22(4)
[Dep. Biol., Southern Station, Box 18, Univ. South. Miss., Hattiesburg 39401] Eight species of searobins are common on the West Florida Shelf between Tampa and Fort Myers. All have the same mouth shape; the principal differences between species are relative mouth size and adult body size. Cluster analysis of searobins based on prey similarity indicated two principal species groups corresponding, in part, to inshore and offshore distribution patterns. Searobins showed two adult feeding modes based on prey size utilization. A "scitulus" mode was shown by /Prionotus scitulus/, /Bellator militaris/, /P. martis/ and /P. roseus/, in which at least 70 percent of the adult diet was made up of prey 10 mm or smaller. A "tribulus" mode was shown by /P. alatus/, /P. tribulus/, /P. ophryas/ and /P. salmonicolor/, in which prey larger than 10 mm made up 66 percent of the adult diet. "Scitulus" mode predators had significantly greater percent relative abundances than "tribulus" mode predators. The dominant method of resource partitioning was macrohabitat partitioning. At high levels of overlap there was evidence of partitioning by prey size.

77-002196 Sekiguchi, H. [FURTHER OBSERVATION ON THE FEEDING HABITS OF PLANKTIVOROUS FISH SAND-EEL IN ISE BAY.] Bull. Jpn. Soc. Sci. Fish. 43 (4): 417-422. Apr. 1977. In Japanese with English summ. SFA 22(4)
[Fac. Fish., Mie Univ., 2-80 Edobaihi, Tsu, Mie, Japan] The present paper deals with the feeding habits of sand-eels (/Ammodytes personatus/), by examining the digestive tract of the specimens obtained in March to June 1974 in Ise Bay. The planktonic organisms eaten were mainly crustaceans, the most dominant in number and in bulk being /Acartia clausi/ and /Paracalanus parvus/ (Copepoda), which were

77-002196 CONTINUED
abundantly found in the environment during the period of sand-eel fisheries. The discrepancy of population density of the two species was not marked in the environment, although /Acartia/ occurred dominantly in March to May and /Paracalanus/ in June. Sand-eels fed exclusively on /Acartia/ in March to May, while /Paracalanus/ was preyed on in June. Sand-eels would prey exclusively on the more dominant one of the two species.

77-002197 Smirnov, Yu. A.; Shastov, Yu. A.; Khrennikov, V. V. ON THE BEHAVIOR AND FEEDING OF JUVENILE ONEGA SALMON (/SALMO SALAR/ MORPHA /SEBAGO/) IN THE WINTER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 503-506. 1976. SFA 22(4)
[Inst. Biol., USSR Acad. Sci., Karelian Br., USSR]

77-002198 Spataru, P. GUT CONTENTS OF SILVER CARP--/HYPOPHTHALMICHTHYS MOLITRIX/ (VAL.)--AND SOME TROPHIC RELATIONS TO OTHER FISH SPECIES IN A POLYCULTURE SYSTEM. Aquaculture 11 (2): 137-146. June 1977. SFA 22(4)
[Fish Aquacult. Res. Stn., Dor, Israel] A study was made of the food eaten by the silver carp, /Hypophthalmichthys molitrix/ (Val.), grown with or without supplementary food in ponds that had previously been used for storage of fish fed on pellets (ponds Types 1 and 3), or which had been kept dry for various periods of time (ponds Types 2 and 4). The special pattern of its gills, which are adapted to retain suspended organisms and particles of sizes less than 20 um, enables the silver carp to filter enormous quantities of phytoplankton and organic particles. A comparative study was made of the trophic relations existing between /Hypophthalmichthys molitrix/ (Val.), /Cyprinus carpio/ (L.) and /Tilapia aurea/ Steindachner, which were the principal species in the polyculture system, and of the influence of the type of pond used on the growth of the fish.--From abstr.

77-002199 Sublette, J. M. THE SUMMER FOOD HABITS OF /NOTROPIS LUTRENSIS/, THE RED SHINER. N. M. Acad. Sci. Bull. 16 (1): 20. Dec. 1975. SFA 22(4)
[Portales High School, Portales, NM 88130] Abstract only. As fish mature, feeding adaptations develop, and the diets of certain kinds become highly restricted. This study was conducted to determine the specialization of the food habits of /Notropis lutrensis/ (Baird and Girard). /Notropis lutrensis/ is classified as a specialized or semi-specialized feeder. On June 6, 1975, a sample of /N. lutrensis/ was collected around 10:00 a.m. from Pennington Creek, Johnson County, Oklahoma, a small stream with riffles and some small pools. This sample showed that Diptera comprised 80 percent of the diet, and that 70 percent of the Diptera were of the family Chironomidae. Five samples taken on July 5-6, 1975, yielded the data which follow. Sample 1, 8:00 p.m., Ephemeroptera, 70 percent; Diptera, 22 percent. This drastic change from Diptera to Ephemeroptera probably was caused by the large numbers of Ephemeroptera available from the major drift period. Sample 2, 9:00 p.m., Ephemeroptera, 44 percent; Diptera, 42 percent. Sample 3, 11:00 p.m., Ephemeroptera, 40 percent; Diptera, 52 percent. With the major drift peak passing, the feeding had returned to Diptera. Sample 4, 1:00 a.m., Ephemeroptera, 8 percent; Diptera, 91 percent. The feeding had almost completely returned to Diptera. Sample 5, 4:00 a.m., no food items found in stomachs. In the sample taken at 8:00 p.m., the stomachs and intestines were almost completely full. In each successive sample following this first, however, the fullness was reduced about one-third until 4:00 a.m. when all stomachs were empty.

77-002200 Thomas, G. THE INFLUENCE OF EATING AND REJECTING PREY ITEMS UPON FEEDING AND FOOD SEARCHING BEHAVIOUR IN /GASTEROSTEUS ACULEATUS/ L. Anim. Behav. 25 (1): 52-66. Feb. 1977. SFA 22(4)
[Zool. Lab. Rijksuniversiteit te Groningen, Haren (Gr.), The Netherlands] Variation in encounter outcome and in area restriction and area avoidance subsequent to eat and reject encounters respectively was examined in relation to immediately prior behaviour and to the total previous experiential history within the daily feeding session. Neither outcome nor post-encounter behaviour was found to be totally dependent upon the current encounter. The motivational variables involved, however, could not be attributed simply to an increase in 'satiation' with cumulative intake over the session. It is proposed that, in addition, short-term positive and negative motivational after-effects are present after eat and reject encounters respectively. The former positively influencing the probability that a subsequent prey item will be eaten and the latter negatively influencing that probability. A rough approximation of the duration of these motivational after-effects was made.

77-002201 Thorpe, J. E. DAILY RATION OF ADULT PERCH, /PERCA FLUVIATILIS/ L. DURING SUMMER IN LOCH LEVEN, SCOTLAND. J. Fish Biol. 11 (1): 55-68. July 1977. SFA 22(4)
[Freshwater Fish. Lab., Pitlochry, Scotland] Adult perch, /Perca fluviatilis/ L., were sampled at 3-hourly intervals throughout 24-h periods from June-Septermber 1971, and in June and August 1972. The wet weight of each major food component from the stomachs was expressed in parts per 10,000 of the fresh weight of the fish. From samples at capture, and others taken from caged fish at known time-intervals after capture, the rate of stomach evacuation was estimated. Food consumption between netting times was calculated as the increment between successive initial values of stomach contents, plus the amount evacuated in the interval. As the evacuation rate of caged fish was slower than that of free fish the estimates of food turnover are minimal ones. The perch were consuming 6.5 percent of their wet body weight per day in June, and this ration had decreased to 3.2 percent by September.

77-002202 Tseytlin, V. B. STRATEGY OF HUNTING AND VERTICAL DISTRIBUTION OF PELAGIC ZOOPLANKTIVOROUS ANIMALS IN A TROPICAL OCEAN. Oceanology 16 5): 507-513. Apr. 1977. SFA 22(4)
[P. P. Shishov Inst. Oceanol., USSR Acad. Sci., Moscow, USSR] Two types of hunting--passive and active--of nonmigrating pelagic zooplanktivorous animals, are examined. According to the principle of vertical distribution, an animal is limited by its size, metabolism, and hunting behavior to inhabiting the maximum depth at which its energy expenditure can be compensated. The energy balance equation is a mathematical formulation of the principle. A comparison of the experimental data on energy metabolism in zooplanktivorous animals with the results of calculations confirms the suggested principle of distribution.

77-002203 Twongo, T. K.; MacCrimmon, H. R. HISTOGENESIS OF THE OROPHARYNGEAL AND OESOPHAGEAL MUCOSA AS RELATED TO EARLY FEEDING IN RAINBOW TROUT, /SALMO GAIRDNERI/ RICHARDSON. Can. J. Zool. 55 (1): 116-128. Jan. 1977. In English with French summ. SFA 22(4)
[East African Mar. Fish. Res. Organ., Zanzibar, Tanzania] The histogenesis of the oropharyngeal and oesophageal mucosa of rainbow trout, /Salmo gairdneri/, eleutheroembryos was studied from hatching to day 40 in relation to early feeding. Numbers of epithelial layers of the mucosa increased appreciably until day 20 but little

77-002203 CONTINUED
thereafter. Differentiation of mucous cells was evident by day 10 and increased rapidly in number until about day 20. The first structurally distinct taste buds were observed in the oropharyngeal mucosa at day 8 and appeared by day 20 to be fully differentiated. An epithelial cell plug that occluded the upper alimentary canal and would have prevented passage of food into the stomach disappeared at about day 17. Teeth, although developing under the mucosa by day 3, had not yet erupted at day 22, the time of first feeding. It is suggested that the onset of first feeding in rainbow trout is in synchrony with the histogenesis of the oropharyngeal mucosa, notably the mucous cells and taste buds. The oropharyngeal mucosa of the fish that failed to feed by day 37 appeared to have undergone extensive hyperplasia while mucous cells were atypical, and taste buds seemingly deformed.

77-002204 Werschkul, D. F.; Christensen, M. T. DIFFERENTIAL PREDATION BY /LEPOMIS MACROCHIRUS/ ON THE EGGS AND TADPOLES OF /RANA/. Herpetologica 33 (2): 237-241. June 1977. SFA 22(4)
[Dep. Zool., Miss. State Univ., Mississippi State 39762] Bluegill sunfishes (/Lepomis macrochirus/) were offered eggs and tadpoles at different developmental stages of /Rana sphenocephala/ and /Rana areolata/. The fish ate significantly more tadpoles than eggs. There was no significant difference between predation on the two species or tadpole stage. /Rana sphenocephala/ eggs stripped of the jelly were eaten in significantly higher amounts than eggs with jelly. However, eggs without jelly were eaten in significantly lower amounts than tadpoles. The differential predation on the eggs and tadpoles resulted from the presence of the jelly, and possibly the immobility of the egg did not release a predatorial response from the fish.

77-002205 White, D. S.; Haag, K. H. FOODS AND FEEDING HABITS OF THE SPOTTED SUCKER, MINYTREMA MELANOPS (RAFINESQUE). Am. Midl. Nat. 98 (1): 137-146. July 1977. SFA 22(4)
[Univ. Okla. Biol. Stn., Kingston 73439] Through its life stages /Minytrema melanops/ changes from a middepth water predator to a bottom forager. Larvae capture individual zooplankters, adding more types of particles to the diet until as juveniles, they begin feeding directly on bottom materials. Young suckers feed as schools during the day while the adults are active mainly at dawn and dusk. Adult digestive tracts contained predominantly detritus and zooplankton with occasional benthic invertebrates. Organic fragments were most numerous followed by sand, copepods and cladocerans. The most important food items by volume were copepods, cladocerans and chironomids with organic fragments making up only a fraction of the bulk except in the fish from Goose Creek, Kentucky. Changes in range and abundance of /Minytrema/ may be directly related to stream alterations affecting its food supplies and feeding habits.

AGE AND GROWTH

77-002206 Bass, A. J. LONG-TERM RECOVERIES OF TAGGED SHARKS. Copeia 1977 (3): 574-575. 25 Aug. 1977. SFA 22(4)
[J. L. B. Smith Inst. Ichthyol., Rhodes Univ., Grahamstown, South Africa]

77-002207 Beamish, R. J.; Chilton, D. AGE DETERMINATION OF LINGCOD (/OPHIODON ELONGATUS/) USING DORSAL FIN RAYS AND SCALES. J. Fish. Res. Board Can. 34 (9): 1305-1313. Sept. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

77-002208 Davis, T. L. O. AGE DETERMINATION AND GROWTH OF THE FRESHWATER CATFISH, /TANDANUS TANDANUS/ MITCHELL, IN THE GWYDIR RIVER, AUSTRALIA. Aust. J. Mar. Freshwater Res. 28 (2): 119-137. Apr. 1977. SFA 22(4)
[Zool. Dep., Univ. New England, Armidale, N.S.W. 2351, Australia] Dorsal spines of /T. tandanus/ from the Gwydir River were used for age determination. Annuli were formed in winter (June-July). The validity of age determination and accuracy of lengths back-calculated from spine radius measurements were supported by tagging data and examination of known age fish. No differences in growth rates were detected between males and females. The variation in growth from season to season was not great. The von Bertalanffy and Gompertz growth equations were used to describe growth in length and weight respectively. The maximum size of catfish in the Gwydir River predicted by these equations was 596 mm and 2605 g.

77-002209 Farmer, G. J.; Beamish, F. W. H.; Lett, P. F. INFLUENCE OF WATER TEMPERATURE ON THE GROWTH RATE OF THE LANDLOCKED SEA LAMPREY (/PETROMYZON MARINUS/) AND THE ASSOCIATED RATE OF HOST MORTALITY. J. Fish. Res. Board Can. 34 (9): 1373-1378. Sept. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartsmouth, NS B2Y 4A2, Canada]

77-002210 Hesse, L. A COMPUTER PROGRAM FOR THE COMPUTATION OF FISHERY STATISTICS ON SAMPLES WITH AGED AND NON-AGED SUBSAMPLES. Fisheries (Bull. Am. Fish. Soc.) 2 (3): 28,55. May-June 1977. SFA 22(4)
[Nebr. Game Parks Comm., Lincoln]

77-002211 Popov, P. A. THE GROWTH AND ONSET OF SEXUAL MATURATION OF THE BROAD WHITEFISH, /COREGONUS NASUS/, AND THE OB WHITEFISH, /COREGONUS LAVARETUS PIDSCHIAN/, OF THE TANAMA RIVER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 414-419. 1976. SFA 22(4)
[Dep. Ichthyol. Hydrobiol., Tomsk Univ., USSR] Growth rate (weight and length) is snown to be connected with the initiation of sexual maturation in the broad whitefish, /Coregonus nasus/, and the Ob whitefish, /Coregonus lavaretus pidschian/, of the Tanama River, and is inherent in these species in other Arctic rivers of Siberia.

77-002212 Price, R. AGE AND GROWTH OF AN UNBALANCED BLUEGILL POPULATION IN MICHIGAN. Trans. Am. Fish. Soc. 106 (4): 331-333. July 1977. SFA 22(4)
[Dep. Zool., South. Ill. Univ., Carbondale 62901]

77-002213 Reagan, R. E., Jr.; Conley, C. M. EFFECT OF EGG DIAMETER ON GROWTH OF CHANNEL CATFISH. Prog. Fish-Cult. 39 (3): 133-134. July 1977. SFA 22(4)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762]

77-002214 Suzuki, T. [BIOLOGICAL CHARACTERISTICS OF THE WALLEYE POLLACK /THERAGRA CHALCOGRAMMA/ (PALLAS) DISTRIBUTED AT SURFACE LAYER IN THE CENTRAL AREA OF THE BERING SEA AS OBSERVED BY FISH FINDER.] Bull. Fac. Fish. Hokkaido Univ. 27 (3-4): 137-144. Dec. 1976. In Japanese with English summ. SFA 22(4)
[Lab. Instrument Eng. Fish., Fac. Fish., Hokkaido Univ., Japan]

77-002215 Wohlfarth, G. W. SHOOT CARP. Bamidgeh 29 (2): 35-56. June 1977. SFA 22(4)
[Fish Aquacult. Res. Stn., Inst. Anim. Sci., Agric. Res. Organ., Dor, Israel] The studies on frequency distributions show that the "shooting phenomenon" or, in more general terms, the asymetrical increase in weight variation is due to interactions between individuals in the population, resulting from competition for food. The significance of the phenomenon may be considered from various points of view, e.g. fish culture, evolutionary adaptation and breeding.--From text. Translations of four Japanese papers on the "shooting phenomenon" are appended.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

77-002216 Allan, J. H. FIRST REPORT OF THE TIGER TROUT HYBRID, /SALMO TRUTTA/ LINNAEUS X /SALVELINUS FONTINALIS/ (MITCHILL), IN ALBERTA. Can. Field-Nat. 91 (1): 85-86. Jan.-Mar. 1977. SFA 22(4)
[Fish Wildl. Div., Dep. Recreation Parks Wildl., Red Deer, AB T4N 5Y, Canada]

77-002217 Anchutin, V. M. DISCOVERY OF THE WALLEYE (/LUCIOPERCA LUCIOPERCA/) IN THE BASIN OF TAZ BAY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 501-503. 1976. SFA 22(4)
[SibrybNIIproyekt, Khanti Mansiisk, USSR]

77-002218 Armstrong, J. W.; Staude, C. P.; Thom, R. M.; Chew, K. K. HABITATS AND RELATIVE ABUNDANCES OF THE INTERTIDAL MACROFAUNA AT FIVE PUGET SOUND BEACHES IN THE SEATTLE AREA. Syesis 9: 277-290. 1976. SFA 22(4)
[Coll. Fish., Univ. Wash., Seattle]

77-002219 Barraclough, W. E.; Peden, A. E. FIRST RECORDS OF THE PRICKLEBREAST POACHER (/STELLERINA XYOSTERNA/), AND THE CUTFIN POACHER (/XENERETMUS LEIOPS/) FROM BRITISH COLUMBIA, WITH KEYS TO THE POACHERS (AGONIDAE) OF THE PROVINCE. Syesis 9: 19-23. 1976. SFA 22(4)
[Pac. Biol. Stn., Nanaimo, BC, Canada] The captures of 18 specimens of the pricklebreast poacher, /Stellerina xyosterna/, and 23 specimens of the cutfin poacher, /Xeneretmus leiops/, provide the first records of each species from British Columbia and extend their known geographic range northward. Included with collections of /Stellerina/ from Hecate Strait were eight juvenile specimens of the closely related warty poacher, /Occella verrucosa/, another species seldom reported from the Province.

77-002220 Borroni, I. INVOLONTARIA INTRODUZIONE NEL LAGO TRASIMENO (UMBRIA) DI UN GOBIDE DI ACQUA SALMASTRA (/KNIPOWITSCHIA PANIZZAI/) A SEGUITO DE PRACTICHE ITTIOGENICHE. [INVOLUNTARY INTRODUCTION INTO LAGO TRASIMENO (CENTRAL ITALY) OF A BRACKISH WATER GOBID (/KNIPOWITSCHIA PANIZZAI/) AS A RESULT OF ICHTHYOLOGICAL PRACTICES.] Mem. Ist. Ital. Idrobiol. 33: 297-304. 1976. In Italian with English summ. SFA 22(4)
[Ist. Ital. Idrobiol., Dott. Marco De Marchi, Pallanza, Italy] For the first time a species belonging to the family Gobiidae has been found in Lago Trasimeno. On the basis of meristic and morphological characters it is has been identified as /Knipowitschia panizzai/ which was formerly known only for brackish waters. Unintentional introduction of this fish with mullet fingerlings was ascertained.--Summ.

77-002221 Edwards, J. C.; Peden, A. E. NORTHERNMOST KNOWN RECORD OF THE EEL GENUS /VENEFICA/ (NETTASTOMIDAE) ALONG THE NORTH AMERICAN WEST COAST. Syesis 9: 371-372. 1976. SFA 22(4)
[British Columbia Prov. Mus., Victoria, BC, Canada]

77-002222 Fairbanks, R. B.; Lawton, R. P. OCCURRENCE OF LARGE STRIPED MULLET, /MUGIL CEPHALUS/, IN CAPE COD BAY, MASSACHUSETTS. Chesapeake Sci. 18 (3): 309-310. Sept. 1977. SFA 22(4)
[Mass. Div. Mar. Fish., Sandwich 02563]

77-002223 Gray, R. H.; dauble, D. D. NEW DISTRIBUTION RECORDS AND NOTES ON LIFE-HISTORY AND BEHAVIOUR OF THE SAND ROLLER, /PERCOPSIS TRANSMONTANA/ (EIGENMANN AND EIGENMANN). Syesis 9: 369-370. 1976. SFA 22(4)
[Freshwater Sci., Ecosystems Dep., Battelle Pacific Northwest Lab., Richland, WA]

77-002224 Gubanov, Ye. P. THE FIRST CATCH OF A TAGGED THRESHER SHARK (/ALOPIAS VULPINUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 497-498. 1976. SFA 22(4)
[AzCherNIRO, Kerch, USSR]

77-002225 Koryakov, Ye. A.; Sidelev, G. N. THE SCULPINS (COTTIDAE) OF LAKE AGATA ON THE PUTORAN PLATEAU. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 498-501. 1976. SFA 22(4)
[Limnol. Inst., USSR Acad. Sci., Listvenichnoye, Irkutsk Prov., USSR]

77-002226 Moore, C. J.; Hixson, J. H.; Burton, D. T. ABUNDANCE AND SEASONAL OCCURRENCE OF SHORE ZONE FISHES IN CENTRAL CHESAPEAKE BAY. ASB (Assoc. Southeast. Biol.) Bull. 24: 72. 1977. SFA 22(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, Md.] Shore zone fishes were sampled monthly over a 5-year period (1971-1975) between Kenwood Beach and Cove Point on the Maryland Western Shore (Calvert County) in the central portion of the Chesapeake Bay. A total of 116,835 fish, representing 54 species, were collected during the years 1972 through 1975. Only relative abundance of each species taken per station was determined during 1971. During the five year period Atlantic menhaden (/Brevoortia tyranus/), Atlantic silverside (/Menidia menidia/), Bay anchovy (/Anchoa

77-002226 CONTINUED
mitchilli/) and spot (/Leiostomus xanthurus/) accounted for 90 percent of all fish collected each year. Strong seasonal patterns in species occurrence and abundance was evident. Similar numbers of fish species were taken from all stations sampled each year. However, there has been a steady decrease in the mean number of species taken per station with 26.5, 25.2, 22.2, 17.0 and 14.5 species collected from all stations during 1971 through 1975, respectively. This decrease was resulted from a decline in numbers of species taken throughout the year and not from a decline during a particular season of the year. Seasonal variations in temperature and salinity were similar among stations and to those found during previous years.

77-002227 Peden, A. E.; Wilson, D. E. DISTRIBUTION OF INTERTIDAL AND SUBTIDAL FISHES OF NORTHERN BRITISH COLUMBIA AND SOUTHEASTERN ALASKA. Syesis 9: 221-248. 1976. SFA 22(4)
[British Columbia Prov. Mus., Victoria, BC, Canada]

77-002228 Peden, A. E. FIRST RECORD OF ATKA MACKEREL, /PLEUROGRAMMUS MONOPTERYGIUS/ (HEXAGRAMMIDAE), IN BRITISH COLUMBIA. Can. Field-Nat. 91 (2): 175-176. Apr.-June 1977. SFA 22(4)
[British Columbia Prov. Mus., Victoria, BC V8W 1A1, Canada]

77-002229 Rao, G. R.; Kaliyamurthy, H. A NOTE ON THE ABUNDANCE AND DISTRIBUTION OF JUVENILES OF TWO BELONIFORM FISHES IN PULICAT LAKE. Indian J. Anim. Sci. 44 (10): 810-814. Oct. 1974. SFA 22(4)
[Cent. Inland Fish. Res. Inst., Madras, Tamil Nadu, India]

77-002230 Royer, L. M.; Anderson, C. B. FIRST RECORD OF THE STONECAT IN SASKATCHEWAN WATERS. Blue Jay 35 (2): 78. June 1977. SFA 22(4)
[Kelsey Inst. Appl. Arts Sci., Saskatoon, SK, Canada]

77-002231 Rudometkina, G. P.; Zharov, V. L. LARVAL BONITO /SARDA/ SP. (SCOMBROIDEI, OSTEICHTHYES) FROM THE TROPICAL ATLANTIC. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 506-509. 1976. SFA 22(4)
[AtlantNIRO, Kaliningrad, USSR]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

77-002232 Avedikova, T. M. REASONS FOR THE VARIABILITY IN SOME BIOLOGICAL PARAMETERS OF THE SEMI-DIADROMOUS FISH POPULATIONS OF THE SEA OF AZOV. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 380-386. 1976. SFA 22(4)
[AzNIIRKh, Rostov-on-Don, USSR] A link is established between the main parameters of the semi-diadromous fish populations of the Sea of Azov (strength of year-classes and rate of growth) and solar activity and the climate-forming factors accompanying it. A shift in the significance of factors according to periods is demonstrated.

77-002233 Gascon, D.; Leggett, W. C. DISTRIBUTION, ABUNDANCE, AND RESOURCE UTILIZATION OF LITTORAL ZONE FISHES IN RESPONSE TO A NUTRIENT/PRODUCTION GRADIENT IN LAKE MEMPHREMAGOG. J. Fish. Res. Board Can. 34 (8): 1105-1117. Aug. 1977. In English with French summ. SFA 22(4)
[W. C. Leggett: Dep. Biol., McGill Univ., Montreal, PQ H3A 1B1, Canada]

IDENTIFICATION, KEYS, CLASSIFICATION

77-002234 Anderson, W. D., Jr.; Kami, H. T.; Johnson, G. D. A NEW GENUS OF PACIFIC ETELINAE (PISCES: LUTJANIDAE) WITH REDESCRIPTION OF THE TYPE-SPECIES. Proc. Biol. Soc. Wash. 90 (1): 89-98. 16 June 1977. SFA 22(4)
[Grice Mar. Biol. Lab., Coll. Charleston, 205 Fort Johnson, Charleston, SC 29412]

77-002235 Bartram, A. A PROBLEMATICAL UPPER CRETACEOUS HOLOSTEAN FISH GENUS /APHANEPYGUS/. J. Nat. Hist. 11 (4): 361-370. July-Aug. 1977. SFA 22(4)
[Dep. Biol., Queen Elizabeth College, Campden Hill, London W.8, England]

77-002236 Boreman, J. , (ed.) GREAT LAKES FISH EGG AND LARVAE IDENTIFICATION: PROCEEDINGS OF A WORKSHOP. U.S. Fish Wildl. Serv. FWS/OBS-76/23. iv + 220p. 1976. SFA 22(4)
[U.S. FWS, 1451 Green Rd., Ann Arbor, MI 48105] The proceedings of a workshop held in Ann Arbor, Mich. in April 19-21, 1976. Several Technical papers and workshop results are presented.--RS

77-002237 Cashner, R. C.; Suttkus, R. D. /AMBLOPLITES CONSTELLATUS/, A NEW SPECIES OF ROCK BASS FROM THE OZARK UPLAND OF ARKANSAS AND MISSOURI WITH A REVIEW OF WESTERN ROCK BASS POPULATIONS. Am. Midl. Nat. 98 (1): 147-161. July 1977. SFA 22(4)
[Dep. Biol. Sci., Univ. New Orleans, LA 70122] A new species of rock bass, /Ambloplites constellatus/, is described from the upland section of the white River in Arkansas and Missouri. It is compared with the closely related northern rock bass (/A. rupestris/) from Missouri and Meramec river populations, the southern rock bass (/A. ariommus/) from the Ouachita and Little river drainages, and with other western rock bass populations of undetermined status. /Ambloplites constellatus/ is distinguished from its congeners by its freckled color pattern and slender body form. /Ambloplites constellatus/ occurs throughout the upper White River. There are two records of the species from the Osage River drainage in Missouri.

77-002238 Castle, P. H. J. THE CONGRID GENUS /FIMBRICEPS/, A SYNONYM OF /GNATHOPHIS/. Copeia 1977 (3): 581-582. 25 Aug. 1977. SFA 22(4)
[Dep. Zool., Victoria Univ. Wellington, Private Bag, Wellington, New Zealand]

77-002239 Compagno, L. J. V. PHYLETIC RELATIONSHIPS OF LIVING SHARKS AND RAYS. Am. Zool. 17 (2): 303-322. 1977. SFA 22(4)
[Dep. Biol. Sci., Stanford Univ., Stanford, CA 94305] A set of hypotheses are developed for the origin of living sharks and rays and the interrelationships of their major groups, using some methods of cladistic analysis to relate groups with shared derived characters. Comparative studies on living sharks and rays combined with new data on fossil sharks suggests that the living groups ultimately stem from a common ancestral group of "neoselachian" sharks with many modern characters. Reinterpretations of "amphistyly" in modern sharks is presented on new data.

77-002240 Dale, G. /APOGON MOSAVI/, A NEW WESTERN ATLANTIC CARDINALFISH, AND A NOTE ON THE OCCURRENCE OF /APOGON LEPTOCALUS/ IN THE BAHAMAS. Proc. Biol. Soc. Wash. 90 (1): 19-29. 16 June 1977. SFA 22(4)
[Dep. Biol. Sci., Nordham Univ., Bronx, NY 10458]

77-002241 Dooley, J. K.; Berry, F. H. A NEW SPECIES OF TILEFISH (PISCES: BRANCHIOSTEGIDAE) FROM THE WESTERN TROPICAL ATLANTIC. Northeast Gulf Sci. 1 (1): 8-13. 1977. SFA 22(4)
Dep. Biol., Adelphi Univ., Garden City, NY 11530] A new species of the new world tilefish genus /Caulolatilus/ (family Branchiostegidae), /C. williamsi/, is described from off Cay Sal Bank and off St. Croix, Virgin Islands. The new species differs from its congeners in having alternating narrow yellow and broad dark body bars and a large yellow spot on the lower part of the rounded caudal fin. The western Atlantic species are identified in a key.

77-002242 Dor, M.; Allen, G. R. /NEOPOMACENTRUS MIRYAE/, A NEW SPECIES OF POMACENTRID FISH FROM THE RED SEA. Proc. Biol. Soc. Wash. 90 (1): 183-188. 16 June 1977. SFA 22(4)
[Coll. Kibbutz Educ., Tel-Aviv, Israel]

77-002243 Hong, S. L. REVIEW OF EASTERN PACIFIC /HAEMULON/ WITH NOTES ON JUVENILE PIGMENTATION. Copeia 1977 (3): 493-501. 25 Aug. 1977. SFA 22(4)
[94 Tyler St., Apt. 6, Boston, MA 02111]

77-002244 Lubbock, R.; Polunin, N. V. C. NOTES ON THE INDO-WEST PACIFIC GENUS /CTENOGOBIOPS/ (TELEOSTEI: GOBIIDAE), WITH DESCRIPTIONS OF THREE NEW SPECIES. Rev. Suisse Zool. 84 (2): 505-514. June 1977. SFA 22(4)
[Zool. Lab., Univ. Cambridge, Downing St., Cambridge, England] The prawn-associated goby genus /Ctenogobiops/ is shown to contain six valid species from the Indo-West Pacific: /C. aurocingulus/ (Herre), /C. crocineus/ Smith, /C. maculosus/ (Fourmonoir), /C. pomastictus/ n. sp., /C. feroculus/ n. sp., and /C. tangaroai/ n. sp. Illustrations are provided of all these species, as well as descriptions of the three which are new.

77-002245 McEachran, J. D. VARIATION IN /RAJA GARMANI/ AND THE STATUS OF /RAJA LENTIGINOSA/ (PISCES: RAJIDAE). Bull. Mar. Sci. 27 (3): 423-439. July 1977. SFA 22(4)
[Dep. Wildl. Fish Sci., Texas A&M Univ., College Station 77843]

77-002246 Miller, P. J. GOBIES FROM RHODES AND THE SYSTEMATIC FEATURES OF /ZEBRUS ZEBRUS/ (TELEOSTEI: GOBIIDAE). Zool. J. Linn. Soc. 60 (4): 339-362. June 1977. SFA 22(4)
[Zool. Dep., Univ. Bristol, Bristol BS8 1UG, England] The gobiid fishes of Rhodes are listed from past records and a recent collection made in 1970. Problems of indentification and selected diagnostic features are described and illustrated. Additions to the species-list include /Chromogobius quadrivittatus/, /Ch. zebratus levanticus/, /Millerigobius macrocephalus/, and /Zebrus zebrus/, although a number of productive habitats remain to be explored. The genus /Zebrus/ is redefined, with osteological characters, and its single species, /Z. zebrus/, redescribed. A comparison with /M. macrocephalus/ tabulates features which may be used to distinguish the two taxa.

77-002247 Schaeffer, B.; Williams, M. RELATIONSHIPS OF FOSSIL AND LIVING ELASMOBRANCHS. Am. Zool. 17 (2): 293-302. 1977. SFA 22(4)
[Dep. Vert. Paleontol., Am. Mus. Nat. Hist., New York, NY 10024] Preliminary cladistic analysis corroborates the hypothesis that the Elasmobranchii and the Holocephali are sister groups, and that the Chondrichthyes are more closely related to the Teleostomi (Acanthodi plus Osteichthyes) than either is to the Placodermi. In regard to the Paleozoic and Mesozoic elasmobranchs, a theory of relationships has been proposed for six better known genera (/Xenacanthus/, /Denaea/, /Cladoselache/, Hybodus/, Ctenacanthus/ and /Paleospinax/) by evaluation of certain characters in the skull, postcranial axial skeleton, fin supports, and fins.

77-002248 Smith, D. G.; Kanazawa, R. H. EIGHT NEW SPECIES AND A NEW GENUS OF CONGRID EELS FROM THE WESTERN NORTH ATLANTIC WITH REDESCRIPTIONS OF /ARIOSOMA ANLIS/, /HILDEBRANDIA GUPPYI/, AND /RHECHIAS VICINALIS/. Bull. Mar. Sci. 27 (3): 530-543. July 1977. SFA 22(4)
[Mar. Biomed. Inst., 200 University Blvd., Galveston, TX 77550]

77-002249 Snyder, D. E.; Snyder, M. B. M.; Douglas, S. C. IDENTIFICAITON OF GOLDEN SHINER, /NOTEMIGONUS CRYSOLEUCAS/, SPOTFIN SHINER, /NOTROPIS SPILOPTERUS/, AND FATHEAD MINNOW, /PIMEPHALES PROMELAS/, LARVAE. J. Fish. Res. Board Can. 34 (9): 1397-1409. Sept. 1977. In English with French summ. SFA 22(4)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

77-002250 Talwar, P. K. THE RARE DEEP-WATER SCORPION-FISH /SNYDERINA GUENTHERI/ IN INDIAN SEAS. Copeia 1977 (3): 580-581. 25 Aug. 1977. SFA 22(4)
[Zool. Surv. India, 27 Jawaharlal Nehru Rd., Calcutta 16, India]

77-002251 Weitzman, S. H. /HYPHESSOBRYCON SOCOLOFI/, A NEW SPECIES OF CHARACOID FISH (TELEOSTEI: CHARACIDAE) FROM THE RIO NEGRO OF BRAZIL. Proc. Biol. Soc. Wash. 90 (2): 326-347. 12 Aug. 1977. SFA 22(4)
[Dep. Vert. Zool., Natl. Mus. Nat. Hist., Washington, DC 20560]

77-002252 Weitzman, S. H. A NEW SPECIES OF CHARACOID FISH, /HYPHESSOBRYCON DIANCISTRUS/, FROM THE RIO VICHADA, ORINOCO RIVER DRAINAGE, COLOMBIA, SOUTH AMERICA (TELEOSTEI: CHARACIDAE). Proc. Biol. Soc. Wash. 90 (2): 348-357. 12 Aug. 1977. SFA 22(4)
[Dep. Vert. Zool., Natl. Mus. Nat. Hist., Washington, DC 20560]

77-002253 Weitzman, S. W.; Kanazawa, R. H. A NEW SPECIES OF PYGMY CHARACOID FISH FROM THE RIO NEGRO AND RIO AMAZONAS, SOUTH AMERICA (TELEOSTEI: CHARACIDAE). Proc. Biol. Soc. Wash. 90 (1): 149-160. 16 June 1977. SFA 22(4)
[Dep. Vert. Zool., Natl. Mus. Nat. Hist., Washington, DC 20560]

77-002254 Williams, J. D.; Etnier, D. A. /PERCINA (IMOSTOMA) ANTESELLA/, A NEW PERCID FISH FROM THE COOSA RIVER SYSTEM IN TENNESSEE AND GEORGIA. Proc. Biol. Soc. Wash. 90 (1): 6-18. 16 June 1977. SFA 22(4)
[U.S. FWS, Office of Endangered Species, Washington, DC 20240]

PARASITES AND DISEASES-GENERAL

77-002255 Amin, O. M. HELMINTH PARASITES OF SOME SOUTHWESTERN LAKE MICHIGAN FISHES. Proc. Helminthol. Soc. Wash. 44 (2): 210-217. July 1977. SFA 22(4)
[Sci. Div., Univ. Wis.-Parkside, Kenosha 53140] Eight species of parasitic helminths, one acanthocephalan, four cestodes, one trematode, one nematode, and one leech species, are reported from various hosts: /Acanthocephalus parksidei/ is reported from 12 host species with 10 new host records; first record in Lake Michigan. Host-/A. parksidei/ associations are discussed. /Echinorhynchus salmonis/ was also recovered. Morphological observations of most parasites are included with particular reference to /Cyathocephalus truncatus/ (new host record in slimy sculpin) and /Eubothrium salvelini/ (new lost in bloater and locality records). Other parasites recovered include /Glaridacris catostomi/, /Proteocephalus exiguus/, /Triganodistomum attenuatum/ (new locality record), /Dacnitoides cotylophora/, and /Placobdella parasitica/ (new host and locality records). The description of /E. salvelini/ is supplemented and the diagnosis of the genera /Cyathocephalus/ and Dacnitoides/ emended.

77-002256 FAO of the UN CONTROL OF THE SPREAD OF MAJOR COMMUNICABLE FISH DISEASES. FAO Fish Rep. No. 192. 44p. 1977. SFA 22(4)
[FAO of the UN, OIE Headquarters, Paris, France]

77-002257 Giussani, G.; Borroni, I.; Grimaldi, E. ROLE OF UN-IONIZED AMMONIA IN PREDISPOSING GILL APPARATUS OF /ALBURNUS ALBURNUS ALBORELLA/ TO FUNGAL AND BACTERIAL DISEASES. Mem. Ist. Ital. Idrobiol. 33: 161-175. 1976. In English with Italian summ. SFA 22(4)
[Ist. Ital. Idrobiol., Dott. Marco De Marchi, Pallanza, Italy] Mass mortalities of fungal and bacterial origin occurring in bleak population (/Alburnus alburnus alborella/) in Lago Maggiore (Northern Italy) did coincide with very sharp peaks of un-ionized ammonia. Possible relationships with eutrophication process are proposed.

77-002258 Hawke, J. P. A SURVEY OF THE DISEASES OF STRIPED BASS, /MORONE SAXATILIS/ AND POMPANO, /TRACHINOTUS CAROLINUS/ CULTURED IN EARTHEN PONDS. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 495-509. 1976. SFA 22(4)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] Routine examinations of pond culture pompano (/Trachinotus carolinus/) and striped bass (/Morone saxatilis/) for diseases were conducted at the Claude Peteet Mariculture Center, Gulf Shores, Alabama and on striped bass cultured in fresh water ponds at the Auburn University Agricultural Experiment Station from June, 1974 through October, 1975. Pathogenic bacteria were isolated from striped bass and pompano. Protozoan parasites were found infesting pampano in brackish water and striped bass in fresh and brackish water. The identify, level of infection and response to treatment of each disease organism is discussed.

77-002259 Hoskins, G. E.; Hulstein, L. P. ANNUAL REPORT OF THE DIAGNOSTIC SERVICE OF THE FISHERIES AND MARINE SERVICE, PACIFIC REGION, FOR 1975. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 707. iii + 35p. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC, Canada] Diseases of fish encountered in 1975 by the Diagnostic Service of the Fisheries and Marine Service, Pacific Region are reported. All the diseases, including neoplasms, recorded by the service are listed. The areas in British Columbia from which infectious hematopoietic necrosis virus was isolated are shown on a map. The major disease problems eccountered are discussed briefly and the diseases found in Federal fish culture facilities are listed in a separate table.

77-002260 Levine, G.; Meade, T. L. THE EFFECTS OF DISEASE TREATMENT ON NITRIFICATION IN CLOSED SYSTEM AQUACULTURE. IN A. W. Avault (ed.). Proc. Annu. Meet. World Maricult. Soc. 7: 483-493. 1976. SFA 22(4)
[Dep. Anim. Sci., Univ. R.I., Kingston 02881] The generally accepted method for disease treatment and control is the addition of therapeutic agents to the diet or the water within the culture system. If agents are to be added to a recirculating unit it is necessary to have a knowledge of the effect of these agents upon the nitrifying bacteria. A rapid and simple method has been developed to screen therapeutic agents to determine their short term effects upon nitrification. The results of testing a group of commonly accepted therapeutic agents are listed. The procedure will show the feasibility of using various agents in cunjunction with nitrification in a recirculating system.

77-002261 Mudry, D. R.; Anderson, R. S. HELMINTH AND ARTHROPOD PARASITES OF FISHES IN THE MOUNTAIN NATIONAL PARKS OF CANADA. J. Fish Biol. 11 (1): 21-33. July 1977. SFA 22(4)
[Bio-systems Consultants, 210-37 St., N.W., Calgary, AB, Canada] Sixteen parasite species including one monogenean, two digeneans, five cestodes, six nematodes, one acanthocephalan, and one copepod were collected from 257 fish of 13 species examined from 32 lake and nine stream sites in the mountain National Parks of British Columbia and Alberta.--From abstr.

BACTERIAL DISEASES

77-002262 Ashburner, L. D. MYCOBACTERIOSIS IN HATCHERY-CONFINED CHINOOK SALMON (/ONCORHYNCHUS TSHAWYTSCHA/ WALBAUM) IN AUSTRALIA. J. Fish Biol. 10 (6): 523-528. June 1977. SFA 22(4)
[Snobs Creek Freshwater Fish. Stn., Alexandra, Victoria, Australia 3714] An increasing incidence of fish mycobacteriosis was detected in Chinook salmon held in fresh water at the Snobs Creek Hatchery. This /Mycobacterium/ sp. infection has been passed on to the F1 generation possibly through an ovarian pathway, either by the egg or more likely through infected ovarian fluid. There is no evidence that the diet was the source of infection.

77-002263 Barahona-Fernandes, M. H. BACTERIAL DISEASES OF SEA BASS (/DICENTRARCHUS LABRAX/ (L.)) REARED IN THE LABORATORY: AN APPROACH TO TREATMENT. Aquaculture 10(4): 317-322. Apr. 1977. SFA 22(4)
[Cent. Oceanol. Bretegne PD 337, 29273 Brest, France] Two nitrofuran derivatives and one antiseptic were tested on the control of a bacterial disease in laboratory reared sea bass. Best results were obtained with 20-min bath treatments of Furanace at 12 mg/l.

77-002264 Bullock, G. L.; Stuckey, H. M. ULTRAVIOLET TREATMENT OF WATER FOR DESTRUCTION OF FIVE GRAM-NEGATIVE BACTERIA PATHOGENIC TO FISHES. J. Fish. Res. Board Can. 34 (8): 1244-1249. Aug. 1977. In English with French Summ. SFA 22(4)
[U.S. FWS, East. Fish. Dis. Lab., Kearneysville, WV 25430]

77-002265 Fuller, D. W.; Pilcher, K. S.; Fryer, J. L. A LEUKOCYTOLYTIC FACTOR ISOLATED FROM CULTURES OF /AEROMONAS SALMONICIDA/. J. Fish. Res. Board Can. 34 (8): 1118-1125. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331]

77-002266 Gilmour, A. CHARACTERISTICS OF MARINE VIBRIOS ISOLATED FROM FISH FARM TANKS. Aquaculture 11 (1): 51-62. May 1977. SFA 22(4)
[Agric. Food Sci. Cent., Queen's Univ. Belfast, Belfast, Northern Ireland] Twenty-five cultures of organisms (Grouped into presumptive /V. parahemolyticus/ and /V. alginolyticus/ strains) isolated from tank water used to farm marine fish were subjected to a series of preliminary tests for the identification of /V. parahaemolyticus/. None were positively identified as this organism. Consequently the isolates, following their characterization as Gram-negative, motile, oxidase-positive rods which were fermentative without the production of gas, together with ten named /Vibrio/ spp., were subjected to various tests and the results were Subjected to computer analysis.

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They were sorted into clusters and it was found that both the presumptive /V. parahaemolyticus/ and /V. alginolyticus/ groups were largely homogeneous. The analysis also showed that the presumptive /V. parahaemolyticus/ strains and one presumptive /V. alginolyticus/ strain were best classified as /V. parahaemolyticus/ and that all but one of the presumptive /V. alginolyticus/ strains would have been best classified as /V. anguillarum/. The named /V. alginolyticus/ strains proved to be a heterogeneous group and were not closely related to any other group of organisms. The significance of the occurrence of /Vibrio/ spp. in tank water used to farm marine fish, especially when this water is heated power station effluent, is Discussed.

77-002267 Horsley, R. W. A REVIEW OF THE BACTERIAL FLORA OF TELEOSTS AND ELASMOBRANCHS, INCLUDING METHODS FOR ITS ANALYSIS. J. Fish Biol. 10 (6): 529-553. June 1977. SFA 22(4)
[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria, LA22 0LP, England] Techniques for the quantitative and qualitative analysis of the commensal bacterial flora of fish are reviewed. The literature concerning the commensal bacterial flora of fish indicates that teleost skin often features 10^2-10^7 organisms per cm^2 of skin, representing the following taxa, in descending numerical order, /Achromobacter/, /Pseudomonas/, /Flavobacterium/ and /Cytophaga/ species also coryneform organisms. Actively feeding teleosts appear to have an alimentary canal bacterial flora similar to that of the skin and gills, often there are from 10^3-10^8 organisms per 1.0 g, wet weight, of tissue. According to the limited data available for elasmobranchs Gram-positive bacteria are the predominant component of the bacterial flora on the skin of sharks, though the bacterial flora of North Sea skate (/Raja/ spp.) is reported as being similar to that of teleosts. The commensal flora of fish, particularly of teleosts, is related to their environment and is influenced by environmental changes that affect the quality of the water. Regular monitoring of the water of commercial fish ponds and aquaria for bacterial quality, temperature, dissolved oxygen concentration and pH, combined with a base-line knowledge of the water's quality, may provide an advanced indication of the presence of bacteria potentially able to produce diseased conditions, and factors that will enhance their growth.

77-002268 Phelps, R. P.; Plumb, J. A.; Harris, C. W. CONTORL OF EXTERNAL BACTERIAL INFECTIONS OF BLUEGILLS WITH POTASSIUM PERMANGANATE. Prog. Fish-Cult. 39 (3): 142-143. July 1977. SFA 22(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

77-002269 Prescott, S. R. A TECHNICAL REPORT ON ORAL IMMUNIZATION OF MARINE TROPICAL FISH AGAINST /VIBRIO ANGUILLARUM/. Aquaculture 11 (3): 281-283. July 1977. SFA 22(4)
[New Technology Ltd., Penshurst, Tonbridge, Kent, England]

77-002270 Sawyer, E. S.; Strout, R. G. SURVIVAL AND GROWTH OF VACCINATED, MEDICATED AND UNTREATED COHO SALMON (/ONCORHYNCHUS KISUTCH/) EXPOSED TO /VIBRIO ANGUILLARUM/. Aquaculture 10 (4): 311-315. Apr. 1977. SFA 22(4)
[Cent. Res. Adv. Stud., Univ. Me., Portland 04102] Vaccination and medication with terramycin resulted in increased survival of pen-reared coho salmon (/Oncorhynchus kisutch/) exposed to vibriosis in a Maine estuary. Mortality was significantly lower (P less than 0.001) in vaccinated fish than in fish receiving terramycin in their food. An

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unexpected increase in growth also occurred in vaccinated and medicated fish. Six months after the outbreak began, 25 percent of vaccinated, 12 percent of the medicated, and 6 percent of the untreated group reached minimum market size (200 g).

77-002271 Schiewe, M. H.; Hodgins, H. O. SPECIFICITY OF PROTECTION INDUCED IN COHO SALMON (/ONCORHYNCHUS KISUTCH/) BY HEAT-TREATED COMPONENTS OF TWO PATHOGENIC VIBRIOS. J. Fish. Res. Board Can. 34 (7): 1026-1028. July 1977. In English with French summ. SFA 22(4)

[NMFS, Northwest Fish. Cent., Seattle, WA 98112]

77-002272 Williams, I. V.; Stelter, D. PART II. INVESTIGATION OF THE USE OF ANTIBIOTIC TO CONTROL THE PRESPAWNING MORTALITY OF THE 1971 CHILKO POPULATION. Int. Pac. Salmon Fish. Comm. Prog. Rep. No. 35. (Part II): 16p. 1977. SFA 22(4)

[Int. Pac. Salmon Fish. Comm., New Westerminster, BC, Canada] Investigations have shown that bacterial diseases can cause death of sockeye salmon prior to spawning. The use of antibiotics to control prespawning mortality was investigated. A subcutaneous injection of combiotic was administered to Chilko River sockeye which were held in a pen on the spawning grounds. The data suggest that enhancement of spawning success of sockeye populations which suffer prespawning losses would be possible with administration of a combiotic. However, the procedure used is not considered practical at this time for the Chilko population.

PROTOZOAN DISEASES

77-002273 Bower, S. M.; Woo, P. T. K. DIVISION AND MORPHOGENESIS OF /CRYPTOBIA CATOSTOMI/ (PROTOZOA: KINETOPLASTIDA) IN THE BLOOD OF WHITE SUCKER (/CATOSTOMUS COMMERSONI/). Can. J. Zool. 55 (7): 1093-1099. July 1977. In English with French summ. SFA 22(4)

[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] /Cryptobia catostomi/ multiplied in the blood of the white sucker (/Catostomus commersoni/) by longitudinal binary fission. The first indication of division was the production of two flagella followed by incomplete nuclear division. By this time the blepharoplast had divided. Each daughter blepharoplast, which gave rise to an old and a new flagellum, migrated to either end of the body. The kinetoplast then divided. The chromatin strand connecting the two nuclei disappeared and the organism completed division giving rise to two specimens. By following the course of infection in a mature white sucker it was observed that type III specimens were most abundant when the parasite population was increasing. As the population leveled off to a plateau, the numbers of type III decreased and were replaced by type II and eventually type I specimens.

77-002274 Bower, S. M.; Woo, P. T. K. MORPHOLOGY AND HOST SPECIFICITY OF /CRYPTOBIA CATOSTOMI/ N. SP. (PROTOZOA: KINETOPLASTIDA) FROM WHITE SUCKER (/CATOSTOMUS COMMERSONI/) IN SOUTHERN ONTARIO. Can. J. Zool. 55 (7): 1082-1092. July 1977. In English with French summ. SFA 22(4)

[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] During the summer of 1975, 285 white sucker from 10 localities in southern Ontario were examined for haemoflagellates. /Cryptobia catostomi/ n. sp., found in the blood of 43.4 percent of the fish examined, occurred in all populations of adult fish and in one of three populations of

77-002274 CONTINUED
juvenile fish. The morphology of /C. catostomi/ n. sp. based on over 500 specimens stained with Giemsa's stain, varied considerably. Cloning showed that this species is pleomorphic and has morphological features and body measurements which encompass most other /Cryptobia/ spp. previously described from the blood of fishes. /Cryptobia catostomi/ n. sp. was distinguished by its host specificity. Infections could not be transmitted to 16 other species of fishes by inoculation of blood from infected sucker. Fishes refractive to infection included /Cyprinus carpio/, /Carassius auratus/, /Rhinichthys atratulus/, /Semotilus atromaculatus/, /Salmo gairdneri/, Oncorhynchus kisutch/, and /Esox lucius/ from which other species of /Cryptobia/ (/C. borreli/, /C. cataractae/, /C. salmositica/, and /C. gurneyorum/) have been reported in North America.

77-002275 Cone, D. K.; Anderson, R. C. MYXOSPORIDAN PARASITES OF PUMPKINSEED (/LEPOMIS GIBBOSUS/ L.) FROM ONTARIO. Parasitology 63 (4): 657-666. Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Guelph, Guelph, ON, Canada]

77-002276 Cottrell, B. J. A TRYPANOSOME FROM THE PLAICE, /PLEURONECTES PLATESSA/ L. J. Fish Biol. 11 (1): 35-47. July 1977. SFA 22(4)
[Dep. Immunol., Middlesex Hosp. Med. Sch., London W1, England] The results of a 12 month study of /Trypanosoma platessae/ Lebailly (1904) a haemoflagellate parasitising the plaice, /Pleuronectes platessa/, L., are presented. The morphological features of the trypanosome are described, with experimental investigations of the host specificity of /T. platessae/. The flagellate occurred at low parasitaemias in wild plaice with a seasonal variation in the numbers of infected hosts, the percentage of parasitised fish reaching a maximum of 20 percent in March and declining in the summer months. Attempts to establish /T. platessae/ in the laboratory, by means of passage of infected blood, gave inconsistent results. Elevated levels of beta-globulins were detected in the sera of /T. platessae/ infected plaice, and it is suggested that this may be associated with antibody secretion to the parasite.

77-002277 Crites, J. L. THE OCCURRENCE OF /EPISTYLIS NIAGARAE/ (CLIOPHORA: PERITRICHIDA) ON FISHES FROM THE ISLAND REGION OF WESTERN LAKE ERIE. Ohio J. Sci. 77 (4): 193-194. July-Aug. 1977. SFA 22(4)
[Dep. Zool. Cent. Lake Erie Area Res., Ohio State Univ., Columbus 43210]

77-002278 Current, W. L.; Janovy, J., Jr. SPOROGENESIS IN /HENNEGUYA EXILIS/ INFECTING THE CHANNEL CATFISH: AN ULTRASTRUCTURAL STUDY. Protistologia 13 (2): 157-167. 1977. In English with French summ. SFA 22(4)
[Sch. Life Sci., Univ. Nebr., Lincoln 68588]

77-002279 Khan, R. A. SUSCEPTIBILITY OF MARINE FISH TO TRYPANOSOMES. Can. J. Zool. 55 (8): 1235-1241. Aug. 1977. In English with French summ. SFA 22(4)
[Dep. Biol. Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

77-002280 Komourdjian, M. P.; Hulbert, W. C.; Fenwick, J. C.; Moon, T. W. DESCRIPTION AND FIRST OCCURRENCE OF /MYXIDIUM ZEALANDICUM/ (PROTOZOA: MYXOSPORIDIA) IN THE NORTH AMERICAN EEL /ANGUILLA ROSTRATA/ LESUEUR. Can. J. Zool. 55 (1): 52-59. Jan. 1977. In English with French summ. SFA 22(4)

[Mar. Sci. Res. Lab., Memorial Univ., St. John's, NF, Canada] /Myxidium zealandicum/ Hine, 1975 is described from gills and kidney of the north American eel /Anguilla rostrata/ collected from the St. Lawrence River near Quebec City and Cornwall. Cysts of /M. zealandicum/ on gills measured up to 1 by 2 mm and in kidneys up to 15 by 20 mm. In addition to single spherical cysts, several polymorphous forms were also observed on the gills. Polymorphous cysts were not found in the kidney. Different stages of spore development were evident in gill cysts and were differentiated by means of a lead hematoxylin--fast green stain. Number and pattern of spore striations were examined by scanning electron microscopy and were highly variable. The invasion of the parasite into kidney tissue appeared to result in less physiological damage to the host than did gill invasion. The existence of this parasite, previously found in eel species in New Zealand, in a North American eel species is discussed.

77-002281 Mandal, A. K. /TRYPANOSOMA CHOUDHURYI/ SP. NOV. FROM /TILAPIA MOSSAMBICA/ (PETERS). Acta Protozool. 16 (1): 1-4. 31 Mar. 1977. In English with French summ. SFA 22(4)

[Zool. Surv. India, 8, Lindsay St., Calcutta-16, India] A new Trypanosome, /Trypanosoma choudhuryi/ sp. nov. is described from a fresh water fish, /Tilapia mossambica/ (Peters). It is monomorphic and atenuated at both ends, measuring 13.25 um in total length. Volutin granules present in the cytoplasm and mainly localized at the border opposite to the undulating membrane. Its affinities with the allied species have been discussed and incorporated in this paper.

77-002282 Minchew, C. D.; Sleight, B. H. III /HENNEGUYA EPISCLERA/ SP. N. (PROTOZOA: MYXOSPORIDA), A NEW MYXOSPORIDAN FROM THE EYE OF THE PUMPKINSEED SUNFISH. Parasitology 63 (4): 667-668. Aug. 1977. SFA 22(4)

[Drawer Z, Dep. Zool., Miss. State Univ., Mississippi State 39762]

77-002283 Minchew, C. D. FIVE NEW SPECIES OF /HENNEGUYA/ (PROTOZOA: MYXOSPORIDA) FROM ICTALURID FISHES. J. Protozool. 24 (2): 213-220. May 1977. SFA 22(4)

[Dep. Zool., Miss. State Univ., Mississippi State 39762] Four new species of /Henneguya/ (myxosporidan) are described from /Ictalurus punctatus/ Rafinesque (channel catfish). They are as follows: /Henneguya postexilis/ sp. n. and /Henneguya longicauda/ sp. n. from the gills; /Henneguya adiposa/ sp. n. from the adipose fin; and /Henneguya diversis/ sp. n. from the liver, kidney, connective tissue of muscles and fins, and tumor-like external growths. /Henneguya pelis/ sp. n. is described from the dermis of /Ictalurus furcatus/ (LeSueur) (blue catfish). The development stages of all described species are discussed. /Henneguya exilis/ Kudo was found on the gills of one /I. punctatus/; notes on its spore characteristics are presented.

77-002284 Moser, M.; Noble, E. R. /ZSCHOKKELLA/ (PROTOZOA: MYXOSPORIDA) IN MACROURID FISHES. Int. J. Parasitol. 7 (2): 97-100. Apr. 1977. SFA 22(4)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106] Six species of /Zschokkella/, three new, were recovered from eleven genera and forty-three species of macrourid fishes found in both the Atlantic and Pacific Oceans and many adjacent seas. The constancy in spore size and shape, over great distances and among many hosts, was remarkable.

77-002285 Moser, M.; Noble, E. R. THREE GENERA OF MYXOSPORIDA (PROTOZOA) IN MACROURID FISHES. Int. J. Parasitol. 7 (2): 93-96. Apr. 1977. SFA 22(4)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106] Three genera and eight species, three new, of myxosporida were recovered from seven genera and twenty species of geographically dispersed macrourid fishes. The constancy in spore dimensions of these species over large distances and among many host species was remarkable. Two genera of myxosporida had species which dwelled in both the gall baldder and urinary bladder/kidney.

77-002286 Sankurathri, C. S. /CONISPORA RENALIS/ GEN. NOV. ET SP. NOV. (MYXOSPORIDA: WARDIIDAE) FROM THE KIDNEY TUBULES OF PACIFIC HAKE, /MERLUCCIUS PRODUCTUS/ (AYRES 1855), IN COASTAL WATERS OF BRITISH COLUMBIA. Can. J. Zool. 55 (7): 1147-1150. July 1977. In English with French summ. SFA 22(4)
[Natl. Wildl. Res. Cent., Can. Wildl. Serv., Ottawa, ON K1A 0E7, Canada] /Conispora renalis/ gen. nov. et sp. nov. is described from the kidney tubules of the Pacific hake, /Merluccius productus/ (Ayres 1855), collected from Stuart Channel, Georgia Strait, British Columbia. /Myxoproteus abyssus/ Yoshino and Moser 1974 is transferred to /Conispora/ as /C. abyssa/ (Yoshino and Moser 1974) n. comb. The genus /Myxoproteus/ Doflein is redefined.

77-002287 Zinn, J. L.; Johnson, K. A.; Sanders, J. E.; Fryer, J. L. SUSCEPTIBILITY OF SALMONID SPECIES AND HATCHERY STRAINS OF CHINOOK SALMON (/ONCORHYNCHUS TSHAWYTSCHA/) TO INFECTIONS BY /CERATOMYXA SHASTA/. J. Fish. Res. Board Can. 34 (7): 933-936. July 1977. In English with French summ. SFA 22(4)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331]

VIRAL DISEASES

77-002288 Lawler, A. R.; Ogle, J. T.; Donnes, C. /DASCYLLUS/ SPP.: NEW HOSTS FOR LYMPHOCYSTIS, AND A LIST OF RECENT HOSTS. J. Wildl. Dis. 13 (3): 307-312. July 1977. SFA 22(4)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564] Lymphocystis disease is reported for the first time from the white-tailed damselfish, /Dascyllus aruanus/, and the black-tailed humbug, /Dascyllus melanurus/. Both species are commercially important exotic aquarium fish from the Indo-Australian Pacific. Lymphcystis is recorded again from the copper banded angelfish, /Chelmon rostratus/. An updated host list for the disease is included.

77-002289 Leino, R. L. INTRANUCLEAR CRYSTALS IN EPITHELIAL CELLS OF /PERCA FLAVESCENS/. Annu. Proc. Electron Microsc. Soc. Am. 35: 404-405. 1977. SFA 22(4)
[Univ. Minn. Sch. Med., 2205 E. 5th St., Duluth 55812] Pepsin-liable nuclear inclusions were found in various epithelial cells of healthy-appearing perch. In electron micrographs, the inclusions appeared as paracrystals often composed of circular subunits 17nm-28nm in diameter. Many cells which contained nuclear crystals showed cytopathological changes: dilated nuclear cisternae, swollen mitochondria with damaged cristae, dilated RER, and vacuolation. Rodlet cells with these inclusions often exhibited cytoplasmic disorganization. The nuclear inclusions are probably associated with a virus infection.

77-002290 Pietsch, J. P.; Amend, D. F.; Miller, C. M. SURVIVAL OF INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS HELD UNDER VARIOUS ENVIRONMENTAL CONDITIONS. J. Fish. Res. Board Can. 34 (9): 1360-1364. Sept. 1977. In English with French summ. SFA 22(4)
[U.S. FWS, West. Fish Dis. Lab., Seattle, WA 98115]

77-002291 Sano, T.; Nishimura, T.; Okamoto, N.; Fukuda, H. STUDIES ON VIRAL DISEASES OF JAPANESE FISHES--VII. A RHABDOVIRUS ISOLATED FROM EUROPEAN EEL, /ANGUILLA ANGUILLA/. Bull. Jpn. Soc. Sci. Fish. 43 (5): 491-495. May 1977. SFA 22(4)
[Tokyo Univ. Fish., Konan 4-5-7, Minato-ku, Tokyo, 108, Japan] The authors carried out virological examination of European elvers, /Anguilla anguilla/ imported from France to Japan with the intention of using it for pond culture. All inoculants prepared from the first six groups of elvers immediately after their arrival in Japan and before distribution to culture ponds showed CPE in RTG-2 cells within 7 days at 15°C after inoculation. And one inoculant from the second five samples collected from eel-ponds showed it within the same number of days. The CPE observed in inoculated RTG-2 cells consisted of spherical pyknosis and subsequent cytoplasmic granulation. However, marginal hyper-chromatosis of nuclear membranes did not occur. This isolant had a stable infectivity of 10 to the 6.1 TCID(50)/ml. Thus far it has been passed 8 times. Negative-stained electron micrographs showed this virus to be a rhabdovirus having the size of 90-95 nm x 170-175 nm. Neutralization tests with specific antisera proved that this agent is not VHSV, SVCV or IHNV. Its pathogenicity to fishes remains to be studied.

77-002292 Walker, R.; Sherburne, S. W. PISCINE ERYTHROCYTIC NECROSIS VIRUS IN ATLANTIC COD, /GADUS MORHUA/, AND OTHER FISH: ULTRASTRUCTURE AND DISTRIBUTION. J. Fish. Res. Board Can. 34 (8): 1188-1195. Aug. 1977. In English with French Summ. SFA 22(4)

OTHER DISEASES AND PARASITES

77-002293 Amin, O. M.; Mackiewicz, J. S. /PROTEOCEPHALUS BUPLANENSIS/ MAYES, 1976 (CESTODA: PROTEOCEPHALIDEA) FROM /SEMOTILUS ATROMACULATUS/ IN WISCONSIN. Proc. Helminthol. Soc. Wash. 44 (2): 228-229. July 1977. SFA 22(4)
[Univ. Wis.-Parkside, Kenosha 53140]

77-002294 Blair, D. A KEY TO CERCARIAE OF BRITISH STRIGEOIDS (DIGENEA) FOR WHICH THE LIFE-CYCLES ARE KNOWN, AND NOTES ON THE CHARACTERS USED. J. Helminthol. 51 (2): 155-166. June 1977. SFA 22(4)
[Dep. Zool., James Cook Univ. North Queensland, Townsville, Qld 4811, Australia] From orginal observations and from data in the literature, a key to cercariae of British strigeoids for which life-cycles are known has been compiled. The value of various characters of systematic importance is discussed.

77-002295 Campbell, R. A. NEW TETRAPHYLLIDEAN AND TRYPANORHYNCH CESTODES FROM DEEP-SEA SKATES IN THE WESTERN NORTH ATLANTIC. Proc. Helminthol. Soc. Wash. 44 (2): 191-197. July 1977. SFA 22(4)
[Dep. Biol., Southeast. Mass. Univ., North Dartmouth 02747]

77-002296 Cannon, L. R. G. SOME ECOLOGICAL RELATIONSHIPS OF LARVAL ASCARIDOIDS FROM SOUTH-EASTERN QUEENSLAND MARINE FISHES. Int. J. Parasitol. 7 (3): 227-232. June 1977. SFA 22(4)
[Queensland Mus., Brisbane, Queensland, Australia] Nine larval types within the genera /Anisakis/, /Terranova/, /Thynnascaris/ and /Contracaecum/ were recovered from south-eastern Queensland marine fishes. Data on (i) incidence, (ii) intensity of infection, (iii) host diet and (iv) habitat for each type suggest /Anisakis/ is an open water type, /Contracaecum/ and inshore, shallow water type and both /Terranova/ and /Thynnascaris/ have intermediate distributions. Host diets indicate /Anisakis/ and /Terranova/ are found in predators of nekton, /Contracaecum/ and /Thynnascaris/ in benthic feeders.

77-002297 Cannon, L. R. G. SOME LARVAL ASCARIDOIDS FROM SOUTH-EASTERN QUEENSLAND MARINE FISHES. Int. J. Parasitol. 7 (3): 233-243. June 1977. SFA 22(4)
[Queensland Mus., Brisbane, Queensland, Australia] A survey of 123 species of fishes from south-eastern Queensland during 1975 revealed in 47 species nine distinct larval types of ascaridoid nematodes: /Anisakis/ Type I, /Terranova/ Types I and II, /Contracaecum/ Types I and II, and /Thynnascaris/ Types I, II, III and IV. These larvae are described and figured.

77-002298 Carlisle, J. C. AN EPIDERMAL PAPILLOMA OF THE ATLANTIC SALMON II: ULTRASTRUCTURE AND ETIOLOGY. J. Wildl. Dis. 13 (3): 235-239. July 1977. SFA 22(4)
[Dep. Avian Aquatic Anim. Med., N.Y. State Vet. Coll., Cornell Univ., Ithaca 14853] ultrastructure of the Atlantic salmon papilloma was studied, and virus isolation was attempted. The papilloma cells were similar to normal epidermis in having interdigitating cell membranes with desmosomes. The nuclei, however, were more regular in shape than normal epidermal nuclei and the chromatin tended to be marginated and clumped. No cytopathic viral agents were isolated.

77-002299 Carlisle, J. C.; Roberts, R. J. AN EPIDERMAL PAPILLOMA OF THE ATLANTIC SALMON I: EPIZOOTIOLOGY, PATHOLOGY AND IMMUNOLOGY. J. Wildl. Dis. 13 (3): 230-234. July 1977. SFA 22(4)
[Dep. Avian Aquatic Anim. Med., N.Y. State Vet. Coll., Cornell Univ., Ithaca 14853] Papillomatosis of Atlantic Salmon (/Salmo salar/) was studied with regard to epizootiology, gross and histologic pathology, and host response. It was found to be a condition of parr in their second summer, but also occasionally of young adult fish (smolts and grilse) which have adapted to salt water. The lesion was

77-002299 CONTINUED
plaque-like to papillomatous and consisted of stratified squamous epithelium with supporting stroma. Immunologic findings tended to support histologic observations that the lesion was ultimately sloughed as a result of a cell mediated immune response.

77-002300 Dronen, N. O., Jr.; Rubec, L. A.; Underwood, H. T. TWO DIGENETIC TREMATODES FROM /UROPHYCIS CIRRATUS/ (GADIDAE) FROM THE GULF OF MEXICO. Trans. Am. Microsc. Soc. 96 (3): 403-406. July 1977. SFA 22(4)
[Dep. Biol., Coll. Sci., Texas A&M Univ., College Station 77843] Two of seven /Urophycis cirratus/ collected in the Gulf of Mexico at 275 fathoms were infected with a total of 92 adult specimens of an opecoelid, genus /Bathycreadium/. One of these fishes was also infected with one adult and two immature specimens of a species of the hemiurid genus /Adinosoma/. /Bathycreadium nanaflexicollis/ n. sp. is described and distinguished from /Bathycreadium flexicollis/ by its smaller body size and larger egg size. The species of /Adinosoma/ is apparently underscribed; but because of the lack of an adequate number of specimens, it is not assigned a new species designation. The mature specimen of /Adinosoma/ sp. is described and contrasted with identified specimens of /A. robustum/.

77-002301 Hauck, A. K.; May, E. B. HISTOPATHOLOGIC ALTERATIONS ASSOCIATED WITH /ANISAKIS/ LARVAE IN PACIFIC HERRING FROM OREGON. J. Wildl. Dis. 13 (3): 290-293. July 1977. SFA 22(4)
[Fish Pathol. Lab., Alaska Dep. Fish Game, Anchorage 99502] A histopathologic study of /Anisakis/ sp. larvae in Pacific herring (/Clupea harengus pallasi/) is presented. Tissue alterations included mechanical compression of the pancreas and liver, granulomatous inflammation and necrosis of the liver, and trauma to the muscularis externa of the pyloric caeca. Host exudate in most lesions contained macrophages (histiocytes) and lymphocytes.

77-002302 Huffman, D. G.; Kliever, R. G. /ECHINORHYNCHUS CANYONENSIS/ SP. N. (ACANTHOCEPHALA) FROM /MAYNEA CALIFORNICA/ (OSTEICHTHYES: ZOARCIDAE) FROM THE MONTEREY SUBMARINE CANYON, CALIFORNIA. Proc. Helminthol. Soc. Wash. 44 (2): 171-176. July 1977. SFA 22(4)
[Aquatic Stn., Southwest Texas State Univ., San Marcos]

77-002303 Khalil, L. F. /GYROMETRA KUNDUCHI/ N. SP., A CESTODARIAN FROM /PLECTORHINCHUS PICTUS/ (THUNBERG, 1792) FROM THE INDIAN OCEAN. J. Fish Biol. 11 (1): 15-19. July 1977. SFA 22(4)
[Commonwealth Inst. Helminthol., St. Albans, Herts., England] /Gyrometra kunduchi/ n. sp. from the body cavity of /Plectorhinchus pictus/ from the Indian Ocean, off the coast of Tanzania is described and figured. The new species is differentiated from /G. albotaenia/, the only species of the genus, by the absence of an apical pit, the extent of testes and vitellaria and measurements of the various organs.

77-002304 Kovaljova, A. A.; Gaevskaya, A. V. [TWO NEW SPECIES OF MONOGENEANS, PARASITES OF ANTARCTIC FISHES.] Zool. Zh. 56 (5): 783-786. May 1977. SFA 22(4)
[Atl. Res. Inst. Fish. Oceanogr., Kaliningrad, USSR] /Pseudobenedenoides antarcticus/ sp. n. is a parasite of /Notothenia kempi/. It differs from the most closely related /P. shorti/ by the structure of haptor, size and structure of anchors, extent of vitellaria, size of eggs, another host and region of finding. /Neopavlovskoides georgianus/ sp. n. was found in /Dissostichus eleginoides/. It differs from the single representative of the genus, /N. dissostichi/, by the structure of transverse bar, anchors, cirrus and some measurable features.

77-002305 Kritsky, D. C.; Kayton, R. J.; Leiby, P. D. /DACTYLOGYRUS UNGUIFORMIS/ SP. N. (MONOGENEA) FROM THE MOTTLED SCULPIN, /COTTUS BAIRDI/ GIRARD, IN IDAHO, WITH SOME TAXONOMIC CONSIDERATIONS IN THE GENUS /DACTYLOGYRUS/. Proc. Helminthol. Soc. Wash. 44 (2): 141-147. July 1977. SFA 22(4)
[Coll. Health-Related Prof., Idaho State Univ., Pocatello 83209]

77-002306 Lester, R. J. G.; Huizinga, H. W. /DIPLOSTOMUM ADAMSI/ SP. N.: DESCRIPTION, LIFE CYCLE, AND PATHOGENESIS IN THE RETINA OF /PERCA FLAVESCENS/. Can. J. Zool. 55 (1): 64-73. Jan. 1977. In English with French summ. SFA 22(4)
[Dep. Pathol., Univ. Guelph, Guelph, ON M1G 2W1, Canada] Forty-two perch eyes (/Perca flavescens/) infected with metacercariae of /Diplostomum adamsi/ were fed to a herring gull (/Larus argentatus/). Eighty adults were recovered from the intestine 10 days later. They were characterized by their small size (1.5 to 2.1 mm), asymmetrical anterior testis, and the absence of vitellaria in forebody anterior to the middle of the ventral sucker. Eggs of /D. adamsi/ passed by the gull embryonated in 22 days at 22°C and hatched when exposed to light. Miracidia penetrated snails of the species /Lymnaea elodes/ and /L. stagnalis/. Forty days later straight-tailed cercariae with six pairs of caudal bodies were released from both lymnaeids. They penetrated and developed in /P. flavescens/ but not in /Salvelinus namaycush/, /Catostomus commersoni/, /Semotilus atromaculatus/, or /Carassius auratus/. In /P. flavescens/, metacercariae were found in clusters in the peripheral retina, in a cavity between the photoreceptor cells and the pigment epithelium. The photoreceptor cells were disorganized but not destroyed, unlike those in the eyes of /Gasterosteus aculeatus/ parasitized by /D. scudderi/.

77-002307 Lester, R. J. G. AN ESTIMATE OF THE MORTALITY IN A POPULATION OF /PERCA FLAVESCENS/ OWING TO THE TREMATODE /DIPLOSTOMUM ADAMSI/. Can. J. Zool. 55 (2): 288-292. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Pathol., Ontario Vet. Coll., Univ. Guelph, Guelph, ON N1G 2W1, Canada] A truncated form of the negative binomial distribution was fitted to the frequency distribution of 5117 metacercariae of /Diplostomum adamsi/ in 115 /Perca flavescens/ taken from the Bay of Quinte, Lake Ontario. Comparison between the fitted curve and the actual distribution suggested that 78 heavily infected fish were missing from the sample. Field and laboratory data indicated that this was due to a higher mortality in the heavily infected fish, particularly during their first 2 years of life, rather than to inadaquate sampling, host resistance, or parasite-parasite interaction.

77-002308 Macdonald, S. A COMPARATIVE STUDY OF THE STRUCTURE OF THE ONCOMIRACIDIA OF THE MONOGENEAN GILL PARASITES /DICLIDOPHORA MERLANGI/, /D. LUSCAE/ AND /D. DENTICULATA/. Int. J. Parasitol. 7 (2): 113-118. Apr. 1977. SFA 22(4)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, P.O. Box 363, Birmingham, England] The structure of the oncomiracidia of gill parasites /Diclidophora merlangi/, /D. luscae/ and /D. denticulata/ is described. The three larvae differ in body length and in the size and arrangement of the hooks but the glandular components and excretory systems are similar. There is some evidence that glandular secretions aid hatching. In newly hatched larvae of /D. merlangi/ marginal hook III is displaced and a pouch of tissue occurs between hooks II and IV. The pouches are presumptive clamp tissue. Many larvae fail to hatch /in vitro/ but form one pair of clamps while within the egg capsule.

77-002309 Margolis, L. PUBLIC HEALTH ASPECTS OF "CODWORM" INFECTION: A REVIEW. J. Fish. Res. Board Can. 34 (7): 887-898. July 1977. In English with French Summ. SFA 22(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

77-002310 McCain, B. B.; Pierce, K. V.; Wellings, S. R.; Miller, B. S. HEPATOMAS IN MARINE FISH FROM AN URBAN ESTUARY. Bull. Environ. Contam. Toxicol. 18 (1): 1-2. July 1977. SFA 22(4)
[Dep. Pathol., Sch. Med., Univ. Calif., Davis 95616]

77-002311 Murray, A. B.; Nance, W. S.; Tarter, D. C. THE OCCURRENCE OF THE LEECH /PISCICOLARIA REDUCTA/ ON /ETHEOSTOMA BLENNOIDES/ FROM WEST VIRGINIA. Trans. Am. Microsc. Soc. 96 (3): 412. July 1977. SFA 22(4)
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701] The leech /Piscicolaria reducta/ Meyer is reported for the first time from West Virginia. Of the five leeches found on three greenside darters, /Etheostoma blennoides/, four were attached to caudal fins, and the fifth was attached to the pectoral fin.

77-002312 Rau, M. E.; Gordon, D. M. A TECHNIQUE FOR THE DEMONSTRATION OF THE METACERCARIAE OF /APATEMON GRACILIS PELLUCIDUS/ (YAMAGUTI, 1933) IN THE DEEP TISSUES OF THE BROOK STICKLEBACK (/CULAEA INCONSTANS/). Can. J. Zool. 55 (7): 1200-1201. July 1977. In English with French summ. SFA 22(4)
[Inst. Parasitol., Macdonald Coll. McGill Univ., Macdonald Coll. Post Office, PQ H0A 1C0, Canada] A technique originally developed for the clearing of specimens for osteological studies has been adapted for the demonstration of /Apatemon gracilis pellucidus/ metacercariae in the deep tissues of the brook stickleback (/Culaea inconstans/).

77-002313 Romestand, B.; Trilles, J.-P. INFLUENCE DES CYMOTHOADIENS (CRUSTACEA, ISOPODA, FLABELLIFERA) SUR CERTAINES CONSTANTES HEMATOLOGIQUES DES POISSONS HOTES. [INFLUENCE OF CYMOTHOIDAE (CRUSTACEA, ISOPODA, FLABELLIFERA) ON SOME HEMATOLOGICAL CONSTANTS OF THE HOST-FISHES.] Z. Parasitenkd. 52 (1): 91-95. 1977. In French with English summ. SFA 22(4)
[Lab. Physiol. Invest., Univ. Sci. Technol. Languedoc Place E. Bataillon, F-34060 Montpellier Cedex, France] Some hematological constants (number of erythrocytes-hemoglobin rate-hematocrit-mean blood corpuscule volume-mean corpuscular hemoglobin concentration-mean corpuscular hemoglobin) are studied in non-parasitized and parasitized Teleost fishes (parasites are Cymothoid Isopods). The parasitized

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fishes show an anaemia, resulting from a decreasing number of erythrocytes in circulation. The spleen undergoes a hypertrophy and a hypervascularization.

77-002314 Stephenson, A. B. GILL DAMAGE IN FISH PRODUCED BY BUCCAL PARASITES. Rec. Auckl. Inst. Mus. 13: 167-173. 10 Dec. 1976. SFA 22(4)
[Auckland Inst. Mus., Private Bag, Auckland, New Zealand] The buccal parasites /Codonophilus imbricatus/ (Fabricius) and /Irona melanosticta/ Schiodte & Meinert (Isopoda: Cymothoidae), were found to cause gill damage in fish through the abrasive action of peraeopods on gill lamellae, and, by virtue of gross size, to physically limit the inward growth of gill rakers. Gill damage is considered more permanent than superficial skin erosion and has been found a useful guide to previous parasitism after the parasite is removed or lost.

77-002315 Uhazy, L. S. DEVELOPMENT OF /PHILOMETROIDES HURONENSIS/ (NEMATODA: DRACUNCULOIDEA) IN THE INTERMEDIATE AND DEFINITIVE HOSTS. Can. J. Zool. 55 (2): 265-273. Feb. 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Univ. Calif., 405 Hilgard Ave., Los Angeles 90024] Development of the larval stages of /Philometroides huronensis/ Uhazy, 1976 took place in the haemocoel of the copepods /Cyclops bicuspidatus thomasi/ and /Cyclops vernalis/. In /C. bicuspidatus thomasi/ held at 10°C, the first moult occurred 14 to 18 days and the second 30 days after exposure to first-stage larvae. In /C. vernalis/ kept at 20 to 23°C, moults from the first to second and second to third stage occurred at 6 to 9 and 14 to 20 days, respectively, after infection. Larval stages are described. Infective larvae were transmitted to laboratory-reared white suckers (/Catostomus commersoni/ (Lacepede)). Fish were kept under controlled temperatures and photoperiods. Thirteen of 41 fish were infected with various stages of the parasite (i.e. third-stage larvae, males, uninseminated and inseminated females). All stages were recovered from the peritoneum around the swim bladder. Few male and inseminated female worms were recovered and development of subgravid and gravid stages was not investigated.

POLLUTION

77-002316 Brungs, W. A.; McCormick, J. H.; Neiheise., T. W.; Spehar, R. L.; Stephan, C. E.; Stokes, G. N. EFFECTS OF POLLUTION ON FRESHWATER FISH. J. Water Pollut. Control Fed. 49 (6): 1425-1493. June 1977. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., Duluth, MN] A review of recent literature.--RS

77-002317 Burton, D. T.; Margrey, S. L.; Richardson, L. B. EFFECTS OF POWER-PLANT ENTRAINMENT TEMPERATURES ON OXYGEN CONSUMPTION PATTERNS OF AMPHIPODS AND GRASS SHRIMP. IN G. W. Esch and R. W. McFarlane (eds.) Thermal Ecology II. ERDA Symp. Ser. 40(CONF-750425). 93-99. 1976. SFA 22(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD] Oxygen-consumption patterns of the amphipod, /Gammarus/, and the grass shrimp, /Palaemonetes/, were used to evaluate the potential effects of exposure to time-temperature changes simulating power-plant condenser entrainment. Base-line metabolism was determined at 15-min intervals for 90 min before thermal exposure. Exposure consisted in (1) a rapid

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5°C thermal increase, (2) a 4-min exposure at the elevated temperature, and (3) a 15-min decay back to ambient temperatures. Oxygen-consumption measurements were then continued at 15-min intervals for 90 min to evaluate the organism's response to the thermal exposure. Oxygen-consumption patterns of /Gammarus/ were studied at acclimation temperatures of 5, 15, and 25°C and of /Palaemonetes/ at 5, 15, 25, and 30°C. Oxygen consumption (Q(O(2))) of /Gammarus/ at all acclimation temperatures was significantly higher than pre-exposure levels for 30 min following thermal exposure but returned to initial levels within 45 min. No changes occurred in Q(O(2)) patterns of /Palaemonetes/ at any acclimation temperature. Although differences in species response patterns occurred, this study shows that both species should be able to tolerate the time-temperature exposure used in the study during entrainment through a once-through low-DeltaT steam electric generating plant.

77-002318 Cairns, J., Jr. AQUATIC ECOSYSTEM ASSIMILATIVE CAPACITY. Fisheries (Bull. Am. Fish. Soc.) 2 (2): 5-7, 24. Mar.-Apr. 1977. SFA 22(4)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061]

77-002319 Cairns, J., Jr. HEATED WASTE-WATER EFFECTS ON AQUATIC ECOSYSTEMS. IN G. W. Esch and R. W. McFarlane (eds.) Thermal Ecology II. ERDA Symp. Ser. 40(CONF-750425). 32-38. 1976. SFA 22(4)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061] Subtle perturbations of aquatic ecosystems caused by heated waste-water discharges are difficult to document because: (1) They are difficult to distinguish from normal successional changes. (2) Normal variability or "noise" masks them. (3) Adequate background data on either ecosystem structure or function are rarely available. (4) Heated waste-water discharges are often associated with other stressful conditions, such as chlorination, addition of heavy metals, etc. (5) Since in the past the burden of proof of "no harmful effect" has been more on regulatory agencies than on dischargers, there was little incentive for gathering appropriate ecological data. (6) The academic community was not prepared for this assignment and frequently gathered inappropriate data. The prospects for determining acute gross changes in aquatic community structure are excellent. Three case histories are discussed, including an example where corrective action "reversed" a structural change. Use of cluster analysis and other techniques should allow the detection of long-term chronic changes in structure despite natural variability and successional processes. Although functional assessments are available (e.g., nutrient and energy transfer), more studies of the effects of pollution on function are needed to increase their utility. Examination of biological and ecological information redundancy is also essential to increase the cost effectiveness of the data-gathering process. Three criteria important in determining whether a system can assimilate heated waste-water discharges without being degraded are: (1) elasticity, the ability to recover from damage, (2) inertia, the ability to resist displacement, and (3) resiliency, the number of times a system can snap back after displacement.

77-002320 Dickson, K. L.; Cairns, J., Jr.; Cherry, D. S.; Stauffer, J. R. AN ANALYSIS OF THE APPLICABILITY OF EPA'S DRAFT WATER-TEMPERATURE CRITERIA: A SITE-SPECIFIC CASE-HISTORY EVALUATION. IN G. W. Esch and F. W. McFarlane (Eds.) Thermal Ecology II. ERDA Symp. Ser. 40(CONF-750425). 316-326. 1976. SFA 22(4)
[Cent. Environ. Stud., VPI & SU, Blacksburg, VA 24061] The applicability of the Environmental Protection Agency's draft water-temperature criteria in evaluating the impact of thermal discharges from Appalachian Power Company's Glen Lyn Power Plant on the New River in Virginia is analyzed. The draft water-temperature criteria are applied to important representative fish species in New River. Since field studies have been conducted at the site, it is possible to analyze the predicted impact using the draft water-temperature criteria and the actual impact as documented by the field studies. No data on water-temperature criteria were available for some important representative fish species at the plant site, but, for species for which data were available, the predicted impact was corroborated by the field studies. It was not possible, however, to make a realistic impact assessment using the draft water-temperature criteria at the glen Lyn site. Field data on the aquatic community and on fish preference and avoidance temperatures proved more useful in evaluating the impact of the thermal discharges.

77-002321 Donovan, O.; Doyle, D.; O'Neill, C.; Kearns, F. OYSTER CREEK I: THERMAL PLUME IMPACT ON FISH DISTRIBUTIONS IN BARNEGAT BAY. Underwater Nat. 10 (3): 14-18. 1977. SFA 22(4)
[Biol. Dep., Jersey City State Coll., Jersey City, NJ]

77-002322 Gergely, A.; Soos, K.; Erdelyi, L.; Cieleszky, V. DETERMINATION OF MERCURY IN FISH FROM RIVERS AND LAKES IN HUNGARY BY ATOMIC ABSORPTION TECHNIQUE. Toxicology 7 (3): 349-355. June 1977. SFA 22(4)
[Inst. Nutr., 1097 Budapest Gyali ut 3/a, Hungary] In 1975, in cooperation with 8 County Hygienic Stations, total mercury content in fish from rivers and lakes in Hungary was measured. The mercury content in fish muscle-tissue from 164 fish samples averaged 0.36 mg/kg. Average levels in different fish species ranged from 0.10 to 0.57 mg/kg. The amount of mercury in fish from rivers and lakes, with the exception of the Danube, was, in general, lower than the tolerance level (0.50 mg/kg) as adopted in many countries. Mercury levels in fish from Lake Balaton did not amount to more than 0.30 mg/kg. The circulating cold vapour atomic absorption method was used to determine the mercury content in the fish samples.

77-002323 Greig, R. A.; Wenzloff, D.; Shelpuk, C.; Adams, A. MERCURY CONCENTRATIONS IN THREE SPECIES OF FISH FROM NORTH ATLANTIC OFFSHORE WATERS. Arch. Environ. Contam. Toxicol. 5 (3): 315-323. 1977. SFA 22(4)
[NMFS, Milford Lab., Milford, CT 06460]

77-002324 Laurent, M.; Calvet, F. UTILISATION DES POISSONS COMME INDICATEURS DE QUALITE DES EAUX, COMPARAISON AVEC LA METHODE DES INDICES BIOTEQUES. APPLICATIONS SUR LE LAXIA: RIVIERE DU PAYS BASQUE FRANCAIS ET LE GABAS: RIVIERE DES LANDES. [UTILIZATION OF FISH FOR WATER QUALITY DETERMINATION. COMPARISON WITH THE BIOTIC INDEX METHOD. APPLICATIONS TO THE LAXIA (FRENCH RIVER IN THE PAYS BASQUE) AND THE GABAS (FRENCH RIVER IN THE LANDES DEPARTMENT).] Ann. Hydrobiol. 8 (1): 67-87. 1977. In French with English summ. SFA 22(4)
[I.N.R.A., B.P. 79, 64200 Biarritz, France] Following the study of

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two rivers (physico-chemistry), invertebrates, fish for one river, and only fish for the one, it is shown that the diversity index applied to the fish stock, give results comparable with those obtained by the physico-chemical study and by the biotic index method to show up the alteration of an aquatic environment. Should these results be confirmed by further studies on other biotopes, the diversity index method applied to fish for pollution characterization would present two advantages: to confirm the other methods and to be workable by a less highly specialized staff.--From summ.

77-002325 Masnik, M. T.; Stauffer, J. R.; Hocutt, C. H.; Wilson, J. H. THE EFFECTS OF AN OIL SPILL ON THE MACROINVERTEBRATES AND FISH IN A SMALL SOUTHWESTERN VIRGINIA CREEK. J. Environ. Sci. Health A Environ. Sci. Eng. 11 (4-5): 281-296. 1976. SFA 22(4)
[Environ. Spec. Br., Dir. Licensing, U.S. Nuclear Reg. Comm., Washington, DC 20545] Plum Creek, a small 4th order tributary of the Clinch River in southwestern Virginia, experienced an oil spill in May, 1973. Approximately 13,000 liters of No. 2 fuel oil entered the creek 4.2 km above the confluence with the Clinch River. Collections of benthos and fishes made at eight stations over a five-month period indicated minimal mortality. Immediate mortality of water snakes and waterfowl appeared relatively high. Fishes did not exhibit significant decreases in numbers of taxa or specimens collected at the site of the spill for the length of the survey.

77-002326 Oberts, G. L. WATER QUALITY EFFECTS OF POTENTIAL URBAN BEST MANAGEMENT PRACTICES: A LITERATURE REVIEW. Wis. Dep. Nat. Resour. Tech. Bull. No. 97. 24p. 1977. SFA 22(4)
[Wis. Dep. Nat. Resour., Madison] This paper presents a review of the literature regarding the water quality effects of all the readily available urban management practices commonly used to alleviate or control pollution from such sources as construction, street runoff, litter, combined sewer overflows, and all predominantly urban activities that potentially add pollutants to streams. Three alternative management approaches for dealing with pollution from urban runoff are discussed: source control, collection system control, and discharge treatment.

77-002327 O'Neill, C.; Doyle, D.; Donovan, O.; Kearns, E. OYSTER CREEK II: BIOCHEMICAL OXYGEN DEMAND AS A MEASURE OF ENTRAINMENT LOSS AT A NUCLEAR POWER STATION. Underwater Nat. 10 (3): 19-20. 1977. SFA 22(4)
[Biol. Dep., Jersey City State Coll., Jersey City, NJ]

77-002328 Parsons, J. D. EFFECTS OF ACID MINE WASTES ON AQUATIC ECOSYSTEMS. Water Air Soil Pollut. 7 (3): 333-354. Mar. 1977. SFA 22(4)
[Dep. Bot., South. Ill. Univ., Carbondale 62901] The Cedar Creek Basin (39th N Parallel 92nd W meridian) was studied for the period June 1952 through August 1954 to observe the effects of both continuous and periodic acid effluent flows on aquatic communities. The acid strip-mine effluent contained ferric and ferrous Fe, Cu, Pb, Zn, Al, Mg, titratable acid, and elevated H ion concentration, and was toxic to many of the aquatic organisms. In the areas of Cedar Creek, subjected to continuous acid flow, planktonic and benthic species had become adapted to the severe conditions and varied in abundance and diversity. No fishes were observed in the continuous acid effluents area. Downstream, where periodic mineral acid conditions changed drastically during an excessive effluent flow, planktonic and benthic

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communities had high diversity but low density. The population of fishes were variable in this stream reach. The chemical basis of water quality variability was shown to be time-related, and statistically related to the aquatic communities. Physical, chemical and biological conditions of acid lakes formed by surface mining were reviewed. In addition to apparent physical and chemical differences in lakes, due in part to variable solar absorbance due to suspended oxides of Fe, chemical variability related to organic composition was reviewed. It is quite probable that degradation of such lakes can be reversed.

77-002329 Penczak, T.; Molinski, M.; Kusto, E.; Palusiak, K.; Panusz, H.; Zalewski, M. THE ECOLOGY OF ROACH, /RUTILUS RUTILUS/ (L.) IN THE BARBEL REGION OF THE POLLUTED PILICA RIVER. II. DRY WEIGHT, ASH AND CONTENTS OF SOME ELEMENTS. Ekol. Pol. 24 (4)d 623-638. 1976. In English with Polish summ. SFA 22(4)
[Inst. Environ. Biol., Univ. Lodz, Poland] In less polluted water the level of dry weight changes during the season in particular annuals, but also increases together with the age of fish. These regularities are much disturbed in case of a population living in considerably polluted water. The value of this parameter has no relation to the sex. The ash content shows a seasonal periodicity in particular age groups although it does not depend on age, sex and extent of water pollution. The fish living in more polluted water have a much lower level of iron and manganese in their mineralized tissues.

77-002330 Piecuch, P. J. (ed.) J. Water Pollut. Control Fed. 49 (6): 899-1566. June 1977. SFA 22(4)
[2626 Pennsylvania Ave., N.W., Washington, DC 20037] This annual Literature Review Issue contains over 50 articles on various waste materials, toxicants, techniques, etc.--RS

77-002331 Pierce, R. H., Jr.; Brent, C. R.; Williams, H. P.; Reeves, S. G. PENTACHLOROPHENOL DISTRIBUTION IN A FRESH WATER ECOSYSTEM. Bull. Environ. Contam. Toxicol. 18 (2): 251-258. Aug. 1977. SFA 22(4)
[Inst. Environ. Sci., Univ. South. Miss., Box 5215, Hattiesburg 39401] The results of this investigation have shown that PCP persisted in leaf litter and sediments for at least seventeen months following contamination. This persistence provides a potential for continuous contamination of the water column and biological magnification via detritus- and benthic-feeding organisms. An investigation of these factors is presently underway.

77-002332 Stauffer, J. R., Jr.; Cairns, J., Jr.; Cherry, D. S.; Denoncourt, R. F.; Dickson, K. L. THE INFLUENCE OF TEMPERATURE ON THE FISH COMMUNITY STRUCTURE OF THE NEW RIVER, GLEN LYN, VIRGINIA. Rev. Biol. (Lisb.) 10 (1-4): 21-48. 1974-1976. SFA 22(4)
[Univ. Md., Cent. Environ. Estuarine Stud., Frostburg 21532]

77-002333 Stauffer, J. R., Jr.; Dickson, K. L.; Cairns, J., Jr.; Cherry, D. S. THE POTENTIAL AND REALIZED INFLUENCES OF TEMPERATURE ON THE DISTRIBUTION OF FISHES IN THE NEW RIVER, GLEN LYN, VIRGINIA. Wildl. Monogr. No. 50. 40p. Nov. 1976. SFA 22(4)
[Univ. Md., Cent. Environ. Estuarine Stud., Frostburg 21532]

77-002334 Thommes, M. M.; Lucas, H. F., Jr.; Edgington, D. N. MERCURY CONCENTRATIONS IN FISH TAKEN FROM OFFSHORE AREAS OF THE GREAT LAKES. Proc. Conf. Great Lakes Res. 15: 192-197. 1972. SFA 22(4)

Twenty-four fish species collected from offshore regions of Lakes Erie, Michigan and Superior during 1967 and 1968 were analyzed for mercury concentration by the neutron activation method. For two individual species, bloater and lake trout (where individual fish sampled were of widely differing size), no correlation could be seen between mercury content and weight. The fish were grouped according to feeding habits and both significant differences and similarities were seen between trophic levels and lakes. Generally, the concentrations of mercury in piscivores were higher than those in either bottom feeders or planktivores. In fish taken from lake Erie, for example, the mercury content of wet flesh from piscivores averaged 0.47 ppm, while that of fish feeding on benthic or planktonic organisms averaged 0.24 and 0.14 ppm, respectively. No significant difference was seen for the same feeding groups from each lake. The bottom feeders, excluding sculpin and stickleback, from Lakes Erie, Michigan and Superior were not significantly different and averaged 0.24, 0.26 and 0.19 ppm, respectively. The sculpins and sticklebacks are interesting anomalies due to their exceptionally high mercury concentration, ranging from 0.52 to 1.13 ppm and 0.96 ppm (wet flesh), respectively. All of these samples were above the U.S. Food and Drug Administration interim guideline of 0.5 ppm. It is suggested that these offshore levels result from natural geochemical sources of mercury.

77-002335 Van Loon, J. C.; Beamish, R. J. HEAVY-METAL CONTAMINATION BY ATMOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS. J. Fish. Res. Board Can. 34 (7): 899-906. July 1977. In English with French summ. SFA 22(4)

[Inst. Environ. Stud., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

77-002336 Veith, G. D.; Kuehl, D. W.; Puglisi, F. A.; Glass, G. E.; Eaton, J. G. RESIDUES OF PCB'S AND DDT IN THE WESTERN LAKE SUPERIOR ECOSYSTEM. Arch. Environ. Contam. Toxicol. 5 (4): 487-499. 1977. SFA 22(4)

[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Fish from western Lake Superior (1972-73) contained DDT and PCB residues at concentrations greater than 0.1 ppm. The most predominant PCB's were those containing 3 to 6 chlorine atoms per molecule, and GLC data indicated that the mixtures were most like the commercial product Aroclor 1254 Other chlorinated contaminants identified by GC/MS analyses and occurring at concentrations less than 0.1 ppm were hexachlorobenzene (C(6)Cl(6)), chlordane, nonaclor, and dieldrin. Lindane, which has been previously reported in Lake Superior, was below the detection limit of approximately 0.01 ppm. The relationship between the size of lake trout and the concentration of total DDT in the fish was compared to measurements reported in previous studies. The comparison suggests that DDT residues have declined since 1968. The concentration of PCBs was estimated to be 0.8 ng/L in Lake Superior water and 0.1 ppm in large zooplankton. The apparent bioconcentration factor for PCBs in Lake Superior fish ranged from 10^5 to 10^6. The concentration of total DDT and PCBs in the larger Lake Superior fish exceeded the 5 ppm tolerance level established by the U.S. Food and Drug Administration for these chemicals in fish to be used for human consumption.

77-002337 Wisseman, R. W.; Cook, S. F., Jr. HEAVY METAL ACCUMULATION IN THE SEDIMENTS OF A WASHINGTON LAKE. Bull. Environ. Contam. Toxicol. 18 (1): 77-82. July 1977. SFA 22(4)

[Evergreen State Coll., Olympia, WA 98505] Freshwater and marine sediments are known to be potential sinks for heavy metals discharged into the atmosphere and into water through man's activities. Under natural conditions lake sediments may concentrate heavy metals to a certain extent over surrounding geological material. Wapato Lake is accumulating high levels of certain heavy metals, particularly lead and zinc, in its sediments from street surface contaminants. This situation is probably of widespread occurrence wherever street surface drainage is discharged directly into natural settling basins of this sort.--Concl.

77-002338 Wright, R. F.; Dale, T.; Gjessing, E. T.; Hendrey, G. R.; Henriksen, A.; Johannessen, M.; Muniz, I. P. IMPACT OF ACID PRECIPATION ON FRESHWATER ECOSYSTEMS IN NORWAY. Water Air Soil Pollut. 6 (2,3,4): 483-499. Sept.-Oct.-Nov. 1976. SFA 22(4)

[Norwegian Inst. Water Res., P.O. Box 333, Blindern, Oslo 3, Norway] Extensive studies of precipitation chemistry during the last 20 yr have clearly shown that highly polluted precipitation falls over large areas of Scandinavia, and that this pollution is increasing in severity and geographical extent. Precipitation in southern Norway, Sweden, and Finland contains large amounts of H^+, SO(4)-- NO(3)- ions, along with heavy metals such as Cu, Zn, Cd, and Pb, that originate as air pollutants in the highly industrialzed areas of Great Britain and central Europe and are transported over long distances to Scandinavia, where they are deposited in precipitation and dry-fallout. In Norway the acidification of fresh waters and accompanying decline and disappearance of fish populations were first reported in the 1920s, and since then in Sorlandet (southernmost Norway) the salmon have been eliminated from several rivers and hundreds of lakes have lost their fisheries. Large areas of western, southern, and eastern Norway have been adversely affected by acid precipitation. The pH of many lakes is below 5.0, and sulfate, rather than bicarbonate, is the major anion. Lakes in these areas are particularly vulnerable to acid precipitation because their watersheds are underlain by highly resistant bedrock with low Ca and Mg contents. Apart from the well-documented decline in fish populations, relatively little is known about the effects of acid precipitation on the biology of these aquatic ecosystems. Biological surveys indicate that low pH-values inhibit the decomposition of allochthonous organic matter, decrease the species number of phyto- and zooplankton and benthic invertebrates, and promote the growth of benthic mosses. Acid precipitation is affecting larger and larger areas of Norway. The source of the pollutants is industrial Europe, and the prognosis is a continued increase in fossil-fuel consumption.--From abstr.

77-002339 Yaguchi, E. M.; Waller, B. J.; Marshall, J. S. PLUTONIUM DISTRIBUTION IN LAKE MICHIGAN BIOTA. Proc. Conf. Great Lakes Res. 17: 150-157. 1974. SFA 22(4)

[Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL] Samples of plankton, algae, benthic invertebrates, and eight fish species were collected from Lake Michigan during 1972 and 1973. After ashing, the samples were analyzed by radiochemical methods and gamma-ray spectrometry for ^{239}Pu, ^{90}Sr, and ^{137}Cs, all of which are components of fallout from atmospheric tests of nuclear weapons. Analyses indicated that ^{239}Pu was scavenged from Lake Michigan water by phytoplankton and attached algae with a concentration factor of up to 10,000. In each of two food chains considered, a progressive discrimination against ^{239}Pu was observed at successive trophic

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levels; (1) phytoplankton to zooplankton to planktivorous fish to piscivorous fish, and (2) benthic invertebrates to bottom-feeding fish. The benthic invertebrates and fish had somewhat higher ^{239}Pu concentrations than their pelagic counterparts, presumably because of their ingestion of sediments. Ash content was correlated with ^{239}Pu concentrations in samples of plankton and fish.

TOXICOLOGY; BIOASSAYS

77-002340 Adams, L. W.; Peterle, T. J. RETENTION OF TRITIUM IN FRESHWATER MARSH ORGANISMS. J. Great Lakes Res. 1 (1): 1-9. 1975. SFA 22(4)
[Dep. Zool., Ohio State Univ., Columbus] Tritium retention for snails (/Viviparus malleatus/, /Lymnaea exilis/), tadpoles (/Rana pipiens/), crayfish (/Procambarus blandingi/), carp (/Cyprinus carpio/), and bluegill sunfish (/Lepomis macrochirus/) was determined over a 48-hour period under laboratory conditons. The organisms were maintined in tritiated water (0.19 uCi/ml) for 48 hours prior to transfer to clean flowing-water tanks, and subsequent sampling. Curves for for tritium retention were resolved into short and long components. Most of the tritium (96.2 percent or more) was lost in the short component. There were significant differences in the turn-over rates of tritium between species. The half-life of tritium in /Viviparus/ exposed to tritium in food under field conditions was longer than the half-life in /Viviparus/ exposed to tritiated water in the laboratory. The differences in half-life were probably due to differences in exposure time and the type of exposure. The half-life of tritium in mallard ducks exposed to tritium for 2 and 4 weeks at Navarre Marsh was approximately 15 days.

77-002341 Alexander, D. G.; Supeene, K. J.; Chu, B. C.; Maciorowski, H. D. THE LETHAL AND SUBLETHAL EFFECTS OF SECONDARY-TREATED SEWAGE EFFLUENT ON VARIOUS FISH AND INVERTEBRATES. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 709. vi + 21p. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB, Canada] Several fish and invertebrates were exposed in acute lethal and sublethal bioassays to nondisinfected secondary-treated sewage effluent. In order of increasing sensitivity to sewage were /Gammarus lacustris/, /Daphnia/ spp., arctic char (/Salvelinus alpinus), lake trout (S. namaycush/), rainbow trout (/Salmo gairdneri/) and whitefish (/Coregonus clupeaformis/). Forced swimming of rainbow trout during sewage exposure resulted in increased mortality. The sensitivity of rainbow trout to phenol increased with pre-exposure to increasing sewage concentrations. Whitefish preferred several sewage concentrations and did not avoid any effluent concentrations tested. Swimming performance of rainbow trout was unaffected to 0.68-0.81 of the 96-hr LC(50).

77-002342 Bahner, L. H.; Wilson, A. j., Jr.; Sheppard, J. M.; Patrick, J. M., Jr.; Goodman, L. R.; Walsh, G. E. KEPONE BIOCONCENTRATION, ACCUMULATION, LOSS, AND TRANSFER THROUGH ESTUARINE FOOD CHAINS. Chesapeake Sci. 18 (3): 299-308. Sept. 1977. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., Gulf Breeze, FL 32561] Accumulation, transfer, and loss of Kepone in estuarine organisms were studied in laboratory bioassays. Kepone was bioconcentrated by oysters (/Crassostrea virginica/), mysids (/Mysidopsis bahia/), grass shrimp (/Palaemonetes pugio/), sheepshead minnows (/Cyprinodon variegatus/),

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and spot (/Leiostomus xanthurus/), from concentrations as low as 0.023 ug/l seawater. Bioconcentration factors ranged from 10 to 340 in static exposures and 900 to 13,500 in flow-through bioassays, and were dependent on species and exposure duration. Depuration of Kepone from oysters in Kepone-free water was rapid (35 percent loss in 24 hours); however, depuration of Kepone was slow in crustaceans and fish, with tissue concentrations decreasing 30-50 percent in 24-28 days. Oysters, fed /Chlorococcum/ containing approximately 34 ug Kepone/g wet weight, attained 0.21 ug Kepone/g (wet tissue) in 14 days, but when fed Kepone-free plankton, depurated Kepone to below detectable concentrations (less than .02 ug/g) within 10 days. Spot obtained Kepone when fed live mysids that had grazed on Kepone-laden brine shrimp. Kepone residues (1.05 ug/g wet tissue) in these fish approached the concentration of their food (1.23 ug/g wet tissue); at the lower concentration tested, Kepone concentrations below detection limits (less than .2 ug/g) in prey accumulated in the predator to detectable concentrations (0.02 ug/g) within 30 days. Bioaccumulation factors (concentration of Kepone in predator/concentation in prey) at 30 days were equal (0.85 spot/mysid; 0.53 mysid/brine shrimp) in the high and low concentrations tested. The initial bioconcentration of Kepone from water by plankton was the dominant source of Kepone to each member of this food chain, but significant (greater than 85 percent) quantities of Kepone transferred from prey to predatory fish.

77-002343 Bass, M. L.; Heath, A. G. CARDIOVASCULAR AND RESPIRATORY CHANGES IN RAINBOW TROUT, /SALMO GAIRDNERI/, EXPOSED INTERMITTENTLY TO CHLORINE. Water Res. 11 (6): 497-502. 1977. SFA 22(4)
[Dep. Biol., Mary Washington Coll., Fredricksburg, VA] Heart rate, ventilation frequency, coughing rate, arterial blood P(O(2)), pH, lactate, methemoglobin, and hematocrit were monitored serially in trout exposed to free chlorine thrice daily of 0.4 or 0.5 mgl^{-1} peak residual concentration. A simultaneous bradycardia and hyperventilation occurred with each pulse of chlorine. Coughing rate rose 15-fold during each chlorination. All three parameters tended to return toward normal rates between pulses with recovery being noticeably better in 0.4 ppm chlorine pulses. Arterial P(O(2)) dropped to 40 percent of the control value during the peak of the first pulse and pH declined 0.25 units. Subsequent chlorine pulses caused more severe declines and progressively less interpulse recovery of these parameters. Blood lactate and hematocrit values were significantly elevated. Methemoglobin rose in concentration but not to a physiologically significant level. It is concluded that free chlorine kills fish by internal hypoxia induced by damage to the gills.

77-002344 Bills, T. D.; Marking, L. L.; Olson, I. E. EFFECTS OF RESIDUES OF THE POLYCHLORINATED BIPHENYL AROCLOR 1254 ON THE SENSITIVITY OF RAINBOW TROUT TO SELECTED ENVIRONMENTAL CONTAMINANTS. Prog. Fish-Cult. 39 (3): 150. July 1977. SFA 22(4)
[U.S. FWS, Fish Control Lab., La Crosse, WI 54601]

77-002345 Bills, T. D.; Marking, L. L.; Chandler, J. H., Jr. MALACHITE GREEN: ITS TOXICITY TO AQUATIC ORGANISMS, PERSISTENCE AND REMOVAL WITH ACTIVATED CARBON. U.S. Fish Wildl. Serv. Invest. Fish Control 75. 6p. 1977. SFA 22(4)
[U.S. FWS, Fish Control Lab., La Crosse, WI] The acute toxicity of malachite green was determined in standardized laboratory tests for chinook salmon, coho salmon, Atlantic salmon, brown trout, rainbow trout, brook trout, channel catfish, largemouth bass, smallmouth bass, bluegill, snails, Asiatic clams, ostracods, freshwater prawns, larval midges, naiads of mayflies, adult newts, larval leopard frogs, and

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larval toads. Bluegills were the most sensitive (96-h LC(50), 0.0305 mg/l), and coho salmon the most resistant (0.383 mg/l). The TILC(50) (lethal concentration producing 50 percent mortality independent of time) for rainbow trout was 0.0998 mg/l. The responses of frog and toad larvae (96-h LC(50), 0.173 and 0.0680 mg/l) were similar to those of fish, whereas adult newts were more resistant (1.03 mg/l). The invertebrates exposed were generally more resistant than the fish and amphibians; the 96-h LC(50)'s ranged from 0.510 to 3.45 mg/l, except for the Asiatic clam, which was extremely resistant (122 mg/l), and the mayfly naiad, which was very sensitive (0.0790 mg/l). The toxicity of malachite green to fish was not affected by water hardness or pH, except bluegills, in which toxicity was about half as great at pH 6.5 as at pH 7.5 to 9.5, and was increased only slightly by increases in water temperatures. Malachite green was very persistent in aqueous solutions; it did not detoxify after 3 weeks of aging in glass containers. The chemical is readily absorbed from aqueous solutions (pH 7.5, total hardness 44 mg/l, temperature 12 C) by filtration through activated carbon; the capicity was 23.4 mg of malachite green per gram of carbon.--From abstr.

77-002346 Birkner, J. H. SELENIUM LEVELS IN AQUATIC ORGANISMS. J. Colo.-Wyo. Acad. Sci. 9 (1): 11. Apr. 1977. SFA 22(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523]
Abstract only.

77-002347 Brooks, A. S.; Seegert, G. L. THE EFFECTS OF INTERMITTENT CHLORINATION ON RAINBOW TROUT AND YELLOW PERCH. Trans. Am. Fish. Soc. 106 (3): 278-286. May 1977. SFA 22(4)
[Dep. Zool., Univ. Wis., Milwaukee 53201]

77-002348 Cherry, D. S.; Larrick, S. R.; Dickson, K. L.; Hoehn, R. C.; Cairns, J., Jr. SIGNIFICANCE OF HYPOCHLORUS ACID IN FREE RESIDUAL CHLORINE TO THE AVOIDANCE RESPONSE OF SPOTTED BASS (/MICROPTERUS PUNCTULATUS/) AND ROSYFACE SHINER (/NOTROPIS RUBELLUS/). J. Fish. Res. Board Can. 34 (9): 1365-1372. Sept. 1977. In English with French summ. SFA 22(4)
[Biol. Dep., VPI & SU, Blacksburg, VA 24061]

77-002349 Chliamovitch, Y.-P.; Kuhn, C. BEHAVIOURAL, HAEMATOLOGICAL AND HISTOLOGICAL STUDIES ON ACUTE TOXICITY OF BIS(TRI-/N/-BUTYLTIN) OXIDE ON /SALMO GAIRDNERI/ RICHARDSON AND /TILAPIA RENDALLI/ BOULENGER. J. Fish Biol. 10 (6): 575-585. June 1977. SFA 22(4)
[Dep. Biol. Anim., Univ. Geneve, CH-1211 Geneve 4, Switzerland] In acute toxicity tests based on the loss of positive rheotaxis, the relationship between exposure time and bis (tri-/n/-butyltin) oxide concentration was determined for /Salmo gairdneri/ and /Tilapia rendalli/. This relationship may be represented by two superimposed rectangular hyperbolas (X-a) (Y-b) = c corresponding to two poisoning mechanisms. The 24-h EC(50) is 30.8 ug/l for trout and 53.2 ug/l for /T. rendalli/. A histopathological study on /S. gairdneri/ shows concnetrations from 5.85 to 0.0117 mg TBTO/1 resulted in damage to the gill epithelium. At low concentrations a degeneration of the cornea and damage to the epithelial cells of bile ducts were also observed. Prior to a loss of positive rheotaxis and with concentrations from 0.023 to 1.17 mg/l, the packed cell volume, the haemoglobin concentration and erythrocyte count increased. Determination of the mean cell volume showed swelling took place at 1.17 mg/l but shrinkage was observed at 0.053 mg/l. These results indicate that TBTO interfered with the process of respiration. A 'safe level' (0.1 ug/l)

77-002349 CONTINUED
is proposed for schistosomiasis control.

77-002350 Clarke, R. McV.; Alexander, D. G.; Boychuk, R. W.; Chu, B. S. C.; Maciorowski, H. D. THE EFFECT OF CHLORINATION ON THE ACUTE LETHAL TOXICITY OF WINNIPEG MUNICIPAL WASTES. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 712. vii + 16p. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB, Canada] Chlorination increased the acute lethal toxicity of Winnipeg municipal wastes to fish and aquatic invertebrates under laboratory conditions and to caged black bullheads (/Ictalurus melas/) in the Red River. The acute lethal toxicity increased with the total residual chlorine concentration, which increased with the chlorine dose. At chlorine doses of 6-8 mg/l, which are necessary to meet the proposed total coliform requirement of less than 1500 Most Probable Number/100 ml in the effluent, the 96-hr LC50s for rainbow trout were 3.5-7.5 percent chlorinated municipal wastes, but the laboratory 96-hr LC50s underestimated the acute lethal toxicity of chlorinated municipal wastes. From studies in other laboratories it is projected that chlorination of Winnipeg municipal wastes at 6-8 mg/l could affect the life cycles of fish and aquatic invertebrates at concentrations as low as 0.03 percent chlorinated municipal wastes. The discharge of municipal wastes chlorinated at 6-8 mg/l could create a fishless zone in the Red River extending at least 0.52 km downstream of the outfall, and could affect the feeding and spawning movements of fish populations in the Red River.

77-002351 Couch, J. A.; Winstead, J. T.; Goodman, L. R. KEPONE-INDUCED SCOLIOSIS AND ITS HISTOLOGICAL CONSEQUENCES IN FISH. Science 197 (4303): 585-587. 5 Aug. 1977. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., Gulf Breeze, FL 32561] Scoliosis in fish is caused by several diverse agents that possibly act on the central nervous system, neuromuscular junctions, or ionic metabolism. The organochlorine pesticide Kepone induces scoliosis in the sheepshead minnow. Some effects associated with Kepone-induced scoliosis in these fish are disruption of myotomal patterns, inter- and intramuscular hemorrhage, fractured centra of vertebrae, and death. The histological syndrome of Kepone poisoning in fish and the clinical syndrome in humans suggest that the nervous system is a primary target for Kepone and that scoliosis is a secondary effect of Kepone poisoning in fish.

77-002352 Dean, H. J.; Colquhoun, J. R.; Simonin, H. A. TOXICITY OF METHOXYCHLOR AND NALED TO SEVERAL LIFE STAGES OF LANDLOCKED ATLANTIC SALMON. N.Y. Fish Game J. 24 (2): 144-153. July 1977. SFA 22(4)
[N.Y. State Dep. Environ. Conserv., Albany] The toxicity of methoxychlor and naled was determined for several life stages of landlocked Atlantic salmon. By static bioassay, it was found that for methoxychlor the 24-hour LC(50) to feeding fry and yearlings was 92 and 75 micrograms per liter, respectively. For naled, the 24-hour LC(50) to feeding fry and fingerlings was 165 micrograms per liter. Effects other than death were also noted.

77-002353 Ellgaard, E. G.; Ochsner, J. C.; Cox, J. K. LOCOMOTOR HYPERACTIVITY INDUCED IN THE BLUEGILL SUNFISH, /LEPOMIS MACROCHIRUS/, BY SUBLETHAL CONCENTRATIONS OF DDT. Can. J. Zool. 55 (7): 1077-1081. July 1977. In English with French summ. SFA 22(4)
[Dep. Biol., Tulane Univ., New Orleans, LA 70118] A quantitative description of the effects of sublethal concentrations of DDT on the locomotor activity of the bluegill sunfish, /Lepomis macrochirus/, is presented. DDT-elicited hyperactive locomotor responses at all the concentrations examined (0.008, 0.01, 0.02, 0.04, 0.06, 0.08, 0.1, and 0.2 parts per billion (ppb)) and the degree of such responses were concentration dependent. Maximal effects at each concentration were observed within 8 days after addition of DDT to the environment. At their maxima, fish at 0.008 ppb were 1.3 times as active as control fish, whereas fish at 0.2 ppb were 3.0 times as active as controls. The effects of DDT on locomotor activity were not reversed even after the fish were transferred back into tap water for 2 weeks.

77-002354 Farr, J. A. IMPAIRMENT OF ANTIPREDATOR BEHAVIOR IN /PALAEMONETES PUGIO/ BY EXPOSURE TO SUBLETHAL DOSES OF PARATHION. Trans. Am. Fish. Soc. 106 (3): 287-290. May 1977. SFA 22(4)
[c/o U.S. EPA, Gulf Breeze, FL 32561]

77-002355 Gerhart, D. Z.; Anderson, S. M.; Richter, J. TOXICITY BIOASSAYS WITH PERIPHYTON COMMUNITIES: DESIGN OF EXPERIMENTAL STREAMS. Water Res. 11 (7): 567-570. 1977. SFA 22(4)
[Dep. Biol., Univ. Minn., Duluth 55812] A method for conducting toxicity or enrichment bioassays using periphyton communities is described. Communities consisting of 35-55 species of diatoms are grown in plastic laboratory streams which may be operated as flowthrough or recirculating systems. Replication of community biomass, species composition and diversity in these streams is excellent, and the communities are easily sampled. The effects of nutrients, heavy metals, or other soluble toxins may be assayed in experiments lasting 3-5 weeks.

77-002356 Giesy, J. P.; Wilner, J. G. FREQUENCY DISTRIBUTIONS OF TRACE METAL CONCENTRATIONS IN FIVE FRESHWATER FISHES. Trans. Am. Fish. Soc. 106 (4): 393-403. July 1977. SFA 22(4)
[Savannah River Ecol. Lab., Drawer E, Aiken, SC 29801]

77-002357 Gordon, M. R.; McLeay, D. J. SEALED-JAR BIOASSAYS FOR PULPMILL EFFLUENT TOXICITY: EFFECTS OF FISH SPECIES AND TEMPERATURE. J. Fish. Res. Board Can. 34 (9): 1389-1396. Sept. 1977. In English with French summ. SFA 22(4)
[Div. Appl. Biol., B.C. Research, Vancouver, BC V6S 2L2, Canada]

77-002358 Gullans, S. R.; Block, R. M.; Rhoderick, J. C.; Burton, D. T.; Liden, L. H. EFFECTS OF CONTINUOUS CHLORINATION ON WHITE PERCH (/MORONE AMERICANA/) AND ATLANTIC MENHADEN (/BREVOORTIA TYRANNUS/) AT TWO TEMPERATURES. ASB (Assoc. Southeast. Biol.) Bull. 24: 55. 1977. SFA 22(4)
[Univ. Md., College Park 20742] Continuous flow bioassays for 96 hours showed menhaden to be more sensitive than white perch to chlorine produced oxidants (CPO) at 15C but not at 25C. The LC50 for menhaden was 0.18 mg/l and 0.15 mg/l CPO at 15C and 25C respectively, while the LC50 for white perch was 0.21 mg/l and 0.15 mg/l CPO at 15C and 25C respectively. During these bioassays 100 percent mortality was observed at higher CPO concentrations, while at lower concentrations

77-002358 CONTINUED
no mortality was observed. Mortality at the higher concentrations occurred within the first 24-48 hr. A concurrent evaluation of various blood and gill physiological parameters revealed an ability of the fish to tolerate the lower CPO concentrations. Hence, chlorine produced oxidants appear to produce a threshold response rather than a gradient response for menhaden and white perch.

77-002359 Ishak, M. M.; Khalil, S. R.; Abdelmalik, W. E. Y. DISTRIBUTION AND TISSUE RETENTION OF CESIUM-134 AND COBALT-60 IN THE NILE CATFISH /CLARIAS LAZERA/ (CUV. & VAL.). Hydrobiologia 54 (1): 41-48. 17 May 1977. SFA 22(4)
[Inst. Oceanogr. Fish., Cairo, Egypt]

77-002360 Jacobsen, O. J. BROWN TROUT (/SALMO TRUTTA/ L.) GROWTH AT REDUCED PH. Aquaculture 11 (1)d 81-84. May 1977. SFA 22(4)
[Zool. Inst., Univ. Oslo, Blindern, Oslo 3, Norway] The Growth of brown trout (/Salmo trutta/) yearlings (18 months) was studied at environmental pH levels of about 6.26, 5.44 and 5.00 and a daily ration of 2.9 percent of the initial body weight. Growth increments for fish at each pH level during a 48-day period were similar.

77-002361 Julin, A. M.; Sanders, H. O. TOXICITY AND ACCUMULATION OF THE INSECTICIDE IMIDAN IN FRESHWATER INVERTEBRATES AND FISHES. Trans. Am. Fish. Soc. 106 (4): 386-392. July 1977. SFA 22(4)
[U.S. FWS, Fish-Pestic. Res. Lab., Columbia, MO 65201]

77-002362 Keeney, D. R. ENVIRONMENTAL IMPACT OF CADMIUM AND OTHER HEAVY METALS FROM LAND-APPLIED SEWAGE SLUDGE. Univ. Wis. Water Resour. Cent. Tech. Rep. Wis WRC 76-03. v + 31p. July 1976. SFA 22(4)
[Dep. Soil Sci., Univ. Wis., Madison]

77-002363 Kendall, M. W. ACUTE EFFECTS OF METHYL MERCURY TOXICITY IN CHANNEL CATFISH (/ICTALURUS PUNCTATUS/) LIVER. Bull. Environ. Contam. Toxicol. 18 (2): 143-151. Aug. 1977. SFA 22(4)
[Dep. Anat., Sch. Med. Sci., Univ. Nev., Reno 89557] The results of this study have demonstrated that in the channel catfish (/Ictalurus punctatus/) a single intraperitoneal injection of 15 mg/kg methyl mercuric chloride caused: 1. Deposition of mercury in the liver. 2. Accumulation and concentration of mercury over the time period of 96 hours. 3. Marked pathology as evidenced by necrosis of exocrine pancreatic and parenchymal cells at 72 and 96 hours. 4. Inflamation at the hepatic capsular surface.--Conl.

77-002364 Koyama, J.; Itazawa, Y. [EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH--I. ANALYTICAL RESULTS OF THE BLOOD AND BONES.] Bull. Jpn. Soc. Sci. Fish. 43 (5): 523-526. May 1977. In Japanese with English summ. SFA 22(4)
[Dep. Fish., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka, 812, Japan] Carp (25 g at Exp. 1, 60-90g at Exps. 2-4, 7 g at Exps. 5,6) were fed with feed containing 0, 28, 140, 570, 1700, or 5700 ppm of Cd in the dry weight for 30 days (Exps. 1-5) or 60 days (Exp. 6). The alkaline phosphatase activity and Ca concentration of serum, the Ca content of vertebrae, Ca contents of vertebral and cranial ash decreased, while the inorganic P concentration of serum increased, with increasing Cd content. Violent swimming and tetany observed with some of Cd administered fish may be due to hyperexcitability of the

77-002364 CONTINUED
nervous system and muscles attributable to the low Ca and high inorganic P levels in the plasma.

77-002365 Koyama, J.; Itazawa, Y. [EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH--II. RESULTS OF MORPHOLOGICAL EXAMINATION.] Bull. Jpn. Soc. Sci. Fish. 43 (5): 527-533. May 1977. SFA 22(4)
[Dep. Fish., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka, 812, Japan] The same individuals used in the experiments reported in the previous paper were examined. Weight gain and hepato-somatic index decreased depending on the Cd content of the feed in most experiments. Lateral curvature of the vertebral column by lateral bending of a/a few centrum/centra was observed in the fish (14 percent of 93 individuals in fish administered with Cd>140 ppm) that had exhibited violent swimming and tetany during the experiment. In Cd administered fish, abnormal black granules which accumulated around blood vessels were observed in the liver, and degeneration (thin wall) of proximal renal tubules and cells that seemed to have lost the protoplasm were observed in the kidney. A possible mechanism for the lateral curvature of the vertebral column may be conjectured, based on the results described in the present and previous papers, as follows: disturbance of the balance between Ca and inorganic P in the plasma caused by degeneration of renal tubules attributable to orally administered Cd to low Ca and high inorganic P levels of the plasma as well as low Ca content of vertebrae to hyperexcitability of the nervous system and muscles to violent swimming and tetany to lateral bending of a/a few centrum/centra to lateral curvature of the vertebral column.

77-002366 Kreutzmann, H.-L. THE EFFECTS OF CHLORAMPHENICOL AND OXYTETRACYCLINE ON HAEMATOPOIESIS IN THE EUROPEAN EEL (/ANGUILLA ANGUILLA/). Aquaculture 10 (4): 323-334. Apr. 1977. SFA 22(4)
[Dep. Biol., William-Pieck-Univ., Rostock, East Germany] Disturbances were observed in the erythropoiesis of the eel (/Anguilla anguilla/) after treatment with chloramphenicol and--to a lesser extent--with oxytetracycline. They are characterized by a vacuolation in the plasma, nuclear changes, a large decrease in the number of erythroblasts, and disturbances in the fat metabolism of erythrocytes.

77-002367 Kumagai, H.; Saeki, K. [STUDIES ON DETERMINATION OF ALKYL MERCURY IN FISH AND SHELLS BY THE STEAM DISTILLATION METHOD.] Bull. Jpn. Soc. Sci. Fish. 43 (6): 755-759. June 1977. In Japanese with English summ. SFA 22(4)
[Yamaguchi Prefect. Res. Inst. Health, Aoi, Yamaguchi City, Japan]

77-002368 Larson, G. L.; Hutchins, F. E.; Lamperti, L. P. LABORATORY DETERMINATION OF ACUTE AND SUBLETHAL TOXICITIES OF INORGANIC CHLORAMINES TO EARLY LIFE STAGES OF COHO SALMON (/ONCORHYNCHUS KISUTCH/). Trans. Am. Fish. Soc. 106 (3): 268-277. May 1977. SFA 22(4)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

77-002369 Liden, L. H.; Burton, D. T.; Margrey, S. L.; Block, R. M.; Rhoderick, J. C. EFFECTS OF CHLORINATED AND BROMOCHLORINATED POWER PLANT CONDENSER COOLING WATERS ON SURVIVAL AND BLOOD PH OF ATLANTIC MENHADEN (/BREVOORTIA TYRANNUS/) AND SPOT (/LEIOSTOMUS XANTHURUS/). ASB (Assoc. Southeast. Biol.) Bull. 24 (2): 66. 1977. SFA 22(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD] Lethal and sublethal effects of chlorinated and bromochlorinated estuarine waters were observed during a long term, 19-20 day on-site study at Potomac Electric Power Company's Morgantown Generating Station. Test water was continuously pumped from the condenser discharge of each of the station's two identical generating units, one treated with chlorine (Cl(2)) and the other with bromine chloride (BrCl). The water flowed into large partitioned troughs designed to simulate first order halogen decay rates observed in the plant discharge canal at 5, 30 and 60 minutes. All fish were acclimated in dechlorinated plant discharge water prior to the study for a minimum of 30 days. Test species were held in separate nylon cages situated in the troughs where mean concentrations of 0.062, 0.032 and 0.014 mg/l Cl(2) (total residual chlorine) and 0.081, 0.045 and 0.020 mg/l BrCl (as equivalent total residual chlorine) were maintained throughout the test period. Preliminary analyses indicate no significant differences occur within or between chlorine, bromine chloride and control menhaden groups. Preliminary analyses of spot data indicate that significant differences in mortality occur between the halogenated groups of fish and the controls; however, no significant differences occur within each halogenated group. Blood pH was measured for all surviving test fish at the termination of the study. No significant differences were found within all menhaden groups, except between fish at the highest Cl(2) (0.062 mg/l) and highest BrCl (0.081 mg/l) concentrations relative to the control fish. Analyses of spot blood pH indicate no difference among fish exposed to BrCl concentrations; however significant differences occur between BrCl and control groups; between Cl(2) and control groups; and between high and low Cl(2) groups. No differences were found within either menhaden or spot controls.--From abstr.

77-002370 Lillie, W. R.; Klaverkamp, J. F. A SYSTEM FOR REGULATING AND RECORDING PH OF SOLUTIONS IN AQUATIC FLOW-THROUGH TOXICITY TESTS. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 710. v + 8p. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Freshwater Inst., Winnipeg, MB, Canada] A modular system for aquatic toxicity testing was modified to allow for continuous regulation and recording of pH in solutions of a flow-through system. Concentrated acids or bases, a proportional diluter, two six channel switches, two strip chart recorders, one pH meter, one titrator, and twelve pH electrodes were employed to control and record four different pH values in twelve aquaria. This report describes the systems, presents performance data, and discusses performance.

77-002371 Lockhart, W. L.; Lutz, A. PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA. Water Air Soil Pollut. 7 (3): 317-332. Mar. 1977. SFA 22(4)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB, Canada] Blood serum and other tissues of white suckers (/Catostomus commersoni/) and other species of fish have been examined in a preliminary effort to understand losses of fish from acid lakes. Maturing females of highly acid George Lake failed to show the normal degree of increase in serum Ca over males captured in the same location. Elevated serum Ca was always observed in females, relative to males, from non-acid locations when maturation stages were similar. A number of body tissues were examined to determine whether the

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distributions of Ca or other elements were altered and the only striking change evident in fish from George Lake was their high Mn content. Bone in particular was examined for N, Na, Mg, P, K, and Ca and no evidence of demineralization was found. Other tests such as hemoglobin indicated that an anticipated adaptive response to asphyxia was absent. Our results indicate that potential mechanisms of fish losses such as asphyxia and starvation are unlikely to have been significant, however, they do not firmly establish any alternate mechanism. As a working hypothesis we suggest that Ca dynamics may limit ovarian development and that absorption of this metal at exchange surfaces may be imparied.

77-002372 Mayer, F. L.; Mehrle, P. M.; Sanders, H. O. RESIDUE DYNAMICS AND BIOLOGICAL EFFECTS OF POLYCHLORINATED BIPHENYLS IN AQUATIC ORGANISMS. Arch. Environ. Contam. Toxicol. SFA 22(4)

[U.S. FWS, Fish-Pesticide Lab., Columbia, MO 65201] Toxicity, residue dynamics, and biological effects of polychlorinated biphenyls (Aroclor series) were investigated in several freshwater invertebrates and fishes. Acute static toxicities (LC50) of PCB's ranged from 3.2 to 2,400 ug/L for invertebrates and from 1.2 to 61 mg/L for fish. The LC50's for invertebrates exposed in flow-through diluter systems for 5 to 10 days were 0.6 to 80 ug/L and those for fish exposed for 30 days were 3.0 to 433 ug/L. Invertebrates accumulated Aroclor 1254 residues up to 6,300 times greater than those to which they were exposed. Biological accumulation of Aroclors 1248 and 1254 by channel catfish (/Ictalurus punctatus/) was 56,370 to 61,190 times the levels in water after 77 days. Dietary exposures of coho salmon (/Oncorhynchus kisutch/) to Aroclor 1254 at rates of 1.45 to 14,500 ug/kg body weight per day had no effect on growth; no observable toxicosis was produced until 260 days; all fish in the group treated with the highest concentration died after 260 to 265 days. Thyroid activity, as measured by 72-hr thyroidal ^{125}I uptake, increased significantly. Thyroid activity in channel catfish fed Aroclors 1232, 1248, 1254, or 1260 at concentrations of 2.4 and 24 ug/g was altered only by Aroclor 1254.

77-002373 McKim, J. M. EVALUATION OF TESTS WITH EARLY LIFE STAGES OF FISH FOR PREDICTING LONG-TERM TOXICITY. J. Fish. Res. Board Can. 34 (8): 1148-1154. Aug. 1977. In English with French Summ. SFA 22(4)

[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804]

77-002374 Morgan, R. P. II; Prince, R. D. CHLORINE TOXICITY TO EGGS AND LARVAE OF FIVE CHESAPEAKE BAY FISHES. Trans. Am. Fish. Soc. 106 (4): 380-385. July 1977. SFA 22(4)

[Chesapeake Biol. Lab., Univ. Md., Solomons 20688]

77-002375 Olofsson, S.; Lindahl, P. E. TEMPERATURE DEPENDENCE OF THE EFFECT OF ETHANOL, AS A MODEL SUBSTANCE, ON COD. Environ. Res. 14 (1): 22-29. Aug. 1977. SFA 22(4)

[Inst. Zoophysiol., Uppsala, Sweden] Using an improved apparatus allowing determinations on fish of varying size, the rotatory-flow technique was applied in studies of the effect of ethanol on the fitness of cod (/Gadus morhua/ L.). This substance is considered to act exclusively on the central nervous system (CNS). As a measure of fitness the "reaction quotient," i.e., the quotient between the critical peripheral velocity and the standard length of the individual fish, was used. Ethanol was administrated via the medium, and blood concentrations sufficiently high to reduce the reaction quotient significantly were attained after 2.0 hours. Each sample of fish was

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tested on the first day of the experiment as a control and, on the following day, after exposure to ethanol. The fish were not fed. The critical peripheral velocity was correlated to the length of the fish in all cases, and also in the intoxicated fish, when the length varied sufficiently. By varying the concentration of ethanol in the medium, a critical concentration in the blood was found which just caused the mean reaction quotient to decrease significantly. With increasing temperature (from 5 to 19°C) the mean critical ethanol concentration in the blood decreases significantly above 10°C.

77-002376 Prater, B. L.; Anderson, M. A. A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING /HEXAGENIA LIMBATA/, /ASELLUS COMMUNIS/, /DAPHNIA MAGNA/, AND /PIMEPHALES PROMELAS/ AS TEST ORGANISMS. Bull. Environ. Contam. Toxicol. 18 (2): 159-169. Aug. 1977. SFA 22(4)
[River Stud. Lab., Biol. Dep., Heidelberg Coll., Tiffin, OH 44883]

77-002377 Rand, G. M. THE EFFECT OF EXPOSURE TO A SUBACUTE CONCENTRATION OF PARATHION ON THE GENERAL LOCOMOTOR BEHAVIOR OF THE GOLDFISH. Bull. Environ. Contam. Toxicol. 18 (2): 259-266. Aug. 1977. Raytheon Co., Oceanogr. & Environ. Serv., P.O. Box 360, Portsmouth, RI 02871]

77-002378 Reinert, R. E.; Stone, L. J.; Bergman, H. L. DIELDRIN AND DDT: ACCUMULATION FROM WATER AND FOOD BY LAKE TROUT (/SALVELINUS NAMAYCUSH/) IN THE LABORATORY. Proc. Conf. Great Lakes Res. 17:P52-58. 1974. SFA 22(4)
[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI] In the laboratory we measured the amounts of dieldrin and p,p'DDT accumulated by fish from contaminated water and food to determine how fish from Lake Michigan accumulate high concentrations of these insecticides from an environment where the concentrations in water are generally less than 0.01 ppb. Eight groups of yearling lake trout (/Salvelinus namaycush/) were exposed to different combinations of dieldrin and p,p'DDT in water and food. Concnetrations of dieldrin and p,p'DDT ranged from 0.006 to 0.010 ppb in water and from 1,700 to 2,300 ppb in food (Oregon moist pellets). After 152 days of exposure to insecticides in water, fish had accumulated an average of 478 ppb dieldrin or 352 ppb p,p'DDT. Fish exposed to dieldrin and p,p'DDT in food accumulated 470 and 648 ppb, respectively. However, it was difficult to determine exactly how much of either insecticide was accumulated from the food because trace amounts (0.003-0.004 ppb) had leached from food or feces. After exposure to the insecticide was terminated, fish eliminated dieldrin at a much faster rate than p,p'DDT. In fish exposed to a combination of dieldrin and p,p'DDT in water and then held for 125 days in uncontaminated water, the total amount of dieldrin (ug) declined 89 percent, but the total amount of p,p'DDT remained unchanged. We used data from this study to estimate how much p,p'DDT adult Lake Michigan coho salmon (/Oncorhynchus kisutch/) accumulated from water and from food during a 104-day period (May-August 1968). The estimates suggest that during these months coho salmon accumulated most of the body burden of p,p'DDT from food.

77-002379 Roubal, W. T.; Collier, T. K.; Malins, D. C. ACCUMULATION AND METABOLISM OF CARBON-14 LABELED BENZENE, NAPHTHALENE, AND ANTHRACENE BY YOUNG COHO SALMON (/ONCORHYNCHUS KISUTCH/). Arch. Environ. Contam. Toxicol. 5 (4): 513-529. 1977. SFA 22(4)
[NMFS, 2725 Montlake Blvd. E., Seattle, WA 98112] Carbon-14 labeled benzene, naphthalene, and anthracene were administered to young coho salmon (/Oncorhynchus kisutch/) in the food and by intraperitoreal injection. Regardless of the mode of application the accumulated carbon-14 (percent administered dose) in key organs (e.g., liver and brain) increased in the order anthracene greater than naphthalene greater than benzene over various time periods. The metabolic fate of the hydrocarbons after intraperitoneal injection was studied. It was shown that the highest percentages of metabolites occurred in the gall bladder; however, significant amounts were also found in the liver, brain, flesh, and "carcass." Solvent partition and thin-layer chromatographic techniques were developed to determine the structure of individual metabolites. In brain, liver, and gall bladder, 1-naphthol and 1-naphthyl glucuronic acid were major products of naphthalene metabolism; however, glycoside/sulfate fractions and mercapturic acid were indicated. The heart and flesh were rich in 1-naphthol and the former organ contained significant amounts of 1,2-dihydro-1,2-dihydroxynaphthalene. The findings indicated that the aromatic hydrocarbons in key organs increased in relation to the number of benzenoid rings. Further, it appears that aromatic metabolites are broadly distributed throughout fish exposed to polynuclear aromatic hydrocarbons.

77-002380 Schneider, M. J.; Genoway, R. G.; Connors, T. J.; Barraclough, S. A. TRAP TANK FOR NONTRAUMATIC SERIAL SAMPLING OF FISH STOCKS IN PHYSIOLOGICAL STUDIES. Prog. Fish-Cult. 39 (3): 135-138. July 1977. SFA 22(4)
[Battelle Pac. Northwest Lab., Richland, WA 99352]

77-002381 Sousa, R. J.; Meade, T. L. THE INFLUENCE OF AMMONIA ON THE OXYGEN DELIVERY SYSTEM OF COHO SALMON HEMOGLOBIN. Comp. Biochem. Physiol. A Comp. Physiol. 58 (1): 23-28. 1977. SFA 22(4)
[Dep. Anim. Sci., 214 Woodward Hall, Univ. R.I., Kingston 02881] The influence of ammonia on respiration has long been recognized, yet no definitive conclusions have been reached. The information provided suggests a mechanism brought about by prolonged exposure to elevated external levels of ammonia in an aqueous environment. Initial stimulation of glycolysis causes a progressive acidemia which, sequentially, has a negative effect on the oxygen transport function of hemoglobin. Spectrophotometric data of hemoglobin solutions from coho salmon yearlings subjected to increased environmental ammonia concentrations revealed a progressive transformation of the characteristic absorption configuration of oxygenated hemoglobin toward that indicative of the deoxygenated molecule.

77-002382 Spieler, R. E.; Noeske, T. A.; Seegert, G. L. DIEL VARIATIONS IN SENSITIVITY OF FISHES TO POTENTIALLY LETHAL STIMULI. Prog. Fish-Cult. 39 (3): 144-147. July 1977. SFA 22(4)
[Milwaukee Pub. Mus., Milwaukee, WI 53233]

77-002383 Tam, K. H.; Conacher, H. B. S. THE SUITABILITY OF THE DRY ASHING PROCEDURE FOR DETERMINATION OF ARSENIC IN MARINE SAMPLES. J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes 12 (3): 213-227. 1977. SFA 22(4)
The dry ashing procedure with Mg(NO(3))(2)/MgO ashing aid, followed by arsenic determination by colorimetry, has been compared to an X-ray fluorescence method for determination of arsenic in marine samples. Good agreement between these techniques indicated the suitability of the dry ashing, colorimetric procedure for determination of "fish-arsenic". A wet digestion procedure using HNO(3)-H(2)SO(4)-HClO(4) was also shown to be suitable.

77-002384 Wang, R. T.; Nicol, J. A. C. EFFECTS OF FUEL OIL ON SEA CATFISH: FEEDING ACTIVITY AND CARDIAC RESPONSES. Bull. Environ. Contam. Toxicol. 18 (2): 170-176. Aug. 1977. SFA 22(4)
[Dep. Zool., Univ. Texas, Austin 78712]

77-002385 Ward, C.; Matsumura, F. FATE OF 2,4,5-T CONTAMINANT, 2,3,7,8-TETRACHLORODIBENZO-/P/-DIOXIN (TCDD) IN AQUATIC ENVIRONMENTS. Univ. Wis. Water Resour. Cent. Tech. Rep. Wis. WRC 77-01. iii + 22p. 1977. SFA 22(4)
[Dep. Entomol., Univ. Wis., Madison]

77-002386 Weis, J. S.; Weis, P. EFFECTS OF HEAVY METALS ON DEVELOPMENT OF THE KILLIFISH, /FUNDULUS HETEROCLITUS/. J. Fish Biol. 11 (1): 49-54. July 1977. SFA 22(4)
[Dep. Zool. Physiol., Rutgers Univ., Newark, NJ 07102] When /F. heteroclitus/ embryos were exposed to inorganic mercury at concentrations of 0.03 or 0.1 mg/l at the early blastula stage, the percentage of successful axis formation was reduced and a significant proportion of embryos developed cyclopia or intermediate conditions leading to cyclopia. Treatment at the late stage reduced the severity of the defects. Embryos which developed in lead at concentrations of 1 and 10 mg/l were normal in appearance until hatching, at which time they exhibited lordosis or were unable to uncurl from the position they had while still inside the chorion. No significant effects of cadmium at concentrations up to 10 mg/l were noted.

77-002387 White, S. (NA + K) ATPASE ACTIVITY IN TROUT EXPOSED TO CD. J. Colo.-Wyo. Acad. Sci. 9 (1): 11. Apr. 1977. SFA 22(4)
[Sch. Nat. Resour., Colo. State Univ., Fort Collins 80523]

77-002388 Yoshinaka, R.; Sato, M.; Ikeda, S. CHANGES IN THE MECHANICAL STRENGTH OF THE BONE AND IN THE COLLAGEN SOLUBILITY OF THE BONE AND THE SKIN OF CARP CAUSED BY BETA-AMINOPROPIONITRILE AND D-PENICILLAMINE. Bull. Jpn. Soc. Sci. Fish. 43 (4): 429-435. Apr. 1977. SFA 22(4)
[Dep. Fish., Kyoto Univ., Kyoto, Japan]

77-002389 Zeitoun, I. H.; Hughes, L. D.; Ullrey, D. E. EFFECT OF SHOCK EXPOSURES OF CHLORINE ON THE PLASMA ELECTROLYTE CONCENTRATIONS OF ADULT RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 34 (7): 1034-1039. July 1977. In English with French summ. SFA 22(4)
[Dep. Environ. Sci., Consumer Power Co., Jackson, MI 49201]

77-002390 Zitko, V.; Carson, W. G.; Metcalfe, C. D. TOXICITY OF PYRETHOIDS TO JUVENILE ATLANTIC SALMON. Bull. Environ. Contam. Toxicol. 18 (1): 35-41. July 1977. SFA 22(4)
[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]
Permethrin is extremely toxic to juvenile Atlantic salmon and has a lethal threshold of approximately 9 ug/l. It is relatively much more persistent than pyrethrins and allethrin. Fish accumulate permethrin from water and the accumulation coefficient of 55 indicates an intermediate degree of accumulation under the used experimental conditions. Lethality of pyrethrins and pyrethroids to juvenile Atlantic salmon and salmonids in general increases with increasing octanol/water partition coefficient.--Concl.

RESEARCH AND MANAGEMENT-GENERAL

77-002391 Organization for Economic Co-operation and Development REVIEW OF FISHERIES IN OECD MEMBER COUNTRIES 1976. Organization for Economic Co-operation and Development, Paris ii + 252p. 1977. SFA 22(4)
[Dir. Inf.. OECD, 2 rue Andre-Pascal, 75775 Paris Cedex 16, France]

77-002392 Ramsay, W. PRIORITIES IN SPECIES PRESERVATION. Environ. Aff. 5 (4): 595-616. 1976. SFA 22(4)
[Resources for the Future, Inc., Washington, DC 20036]

77-002393 Svetovidov, A. N. ON THE CENTENARY OF THE BIRTH OF V. K. SOLDATOV (1875-1975). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 491-493. 1976. SFA 22(4)

ADMINISTRATION AND PLANNING

77-002394 Fletcher, H. F. TOWARD A RELEVANT SCIENCE: FISHERIES AND AQUATIC SCIENTIFIC RESOURCE NEEDS IN CANADA. J. Fish. Res. Board Can. 34 (7): 1046-1073. July 1977. In English with French summ. SFA 22(4)
[Dep. Fish. Environ., Plan. Finance Serv., Off. Sci. Advis., Ottawa, ON K1A 1C7, Canada]

REPORTS OF FISHERY STATIONS, STATES, ETC.

77-002395 FAO of the UN REPORT OF THE TENTH SESSION OF THE COMMITTEE ON FISHERIES. ROME, 3-10 JUNE 1975. FAO Fish. Rep. No. 162. viii + 37p. 1975. SFA 22(4)
[Rome, Italy]

77-002396 Foyle Fisheries Commission TWENTY-FOURTH ANNUAL REPORT 1975. Foyle Fish. Comm., Londonderry, Northern Ireland 81p. 1976. SFA 22(4)
[8 Victoria Rd., Londonderry, Northern Ireland]

77-002397 Freshwater Biological Association FORTY-FITH ANNUAL REPORT. Freshwater Biological Assiciation, Cumbria, England 45: 128p. 1977. SFA 22(4)
[The Ferry House, Ambleside, Cumbria LA 22 OLP, England]

77-002398 International Pacific Halibut Commission ANNUAL REPORT 1976. Int. Pac. Halibut Comm. Annu. Rep. 1976. 40p. 1977. SFA 22(4)
[P.O. Box 5009, University Station, Seattle, WA 98105]

77-002399 Verhoeven, L. A. , (ed.) 29TH ANNUAL REPORT OF PACIFIC MARINE FISHERIES COMMISSION FOR THE YEAR 1976. Pac. Mar. Fish. Comm. Annu. Rep. No. 29. 60p. May 1977. SFA 22(4)
[Pac. Mar. Fish. Comm., 528 S.W. Mill St., Portland, OR 97201]

HABITAT ALTERATION

77-002400 Armitage, P. D. INVERTEBRATE DRIFT IN THE REGULATED RIVER TEES, AND AN UNREGULATED TRIBUTARY MAIZE BECK, BELOW COW GREEN DAM. Freshwater Biol. 7 (2): 167-183. Apr. 1977. SFA 22(4)
[Freshwater Biol. Assoc., River Lab., Fast State, Wareham, Dorset BH20 6BB, England]

77-002401 Arner, D. H.; Robinette, H. R.; Frasier, J. E.; Gray, M. H. EFFECTS OF CHANNELIZATION OF THE LUXAPALILA RIVER ON FISH, AQUATIC INVERTEBRATES, WATER QUALITY, AND FURBEARERS. U.S. Fish Wildl. Serv. FWS/OBS-76/08. viii + 58p. June 1976. SFA 22(4)
[Dep. Wildl. Fish., Miss. State Univ., Mississippi State 39762]
Biological data collected from July 1973 to January 1976 from an old channelized segment (over 52 years), an unchannelized segment, and a newly channelized segment of the Luxapalila River, Mississippi and Alabama, revealed that productivity of the old channelized segment has not recovered to the levels exhibited in the unchannelized segment. There were no evident differences in water quality between the three segments except for higher turbidity trends in the newly channelized segment. The number of plankton organisms was higher in the newly channelized segment, possibly due to influence of sewage. Diversity of plankton, macroinvertebrates, and fish was greater in the unchannelized segment than in the channelized segments. The average number/sample of fish and macroinvertebrates was significantly higher (P less than .05) in the unchannelized segment. Average weight of largemouth bass was greater in the unchannelized than in either of the channelized segments. The length frequency histogram of this species shows a more normal distribution of length classes in the

77-002401 CONTINUED
unchannelized segment, whereas in the two channelized segments there is an evident skewed array toward the smaller length classes. Utilization of an expanding habitat created by annual flooding was indicated by the preponderance of terrestrial invertebrates found in stomachs of fish collected behind the levee. Indices of abundance of furbearers associated with the river were obtained by night lighting, sign count, and trapping. Muskrat and beaver, the species most commonly associated with an aquatic habitat, were far more numerous in the unchannelized segment than in either the old or newly channelized segments.

77-002402 Arner, D. H. TRANSMISSION LINE RIGHTS-OF-WAY MANAGEMENT. U.S. Fish Wildl. Serv. Top. Briefs: Fish Wildl. Resour. Elec. Power Generation No. 2. 12p. Mar. 1977. SFA 22(4)
[Dep. Wildl. Fish., Miss. State Univ., Drawer LW, State College 39762] Proper management of transmission line rights-of-way (ROW) to maximize benefits to fish and wildlife resources is highly desirable because a large amount of land is now preempted by these ROW, and it is anticipated that future growth of electric generating capacity will require additional large acreages of land for transmission line ROW. This paper presents some current ROW management practices and their costs, the bases for selecting a specific management technique, and some possible management goals to benefit fish and wildlife in various local situations.

77-002403 Barnard, R. S. MORPHOLOGY AND MORPHOMETRY OF A CHANNELIZED STREAM: THE CASE HISTORY OF BIG PINE CREEK DITCH, BENTON COUNTY, INDIANA. Purdue Univ. Water Resour. Cent. Tech. Rep. No. 92. xi + 86p. June 1977. SFA 22(4)
[Dep. Biosci., Purdue Univ., West Lafayette, IN]

77-002404 Barton, B. A. SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STEAM IN SOUTHERN ONTARIO. Freshwater Biol. 7 (2): 99-108. Apr. 1977. SFA 22(4)
[Fish Wildl. Div., Sam Livingston Fish Hatchery, 1440-17A St. S.E., Calgary, AB T2G 4T9, Canada] A limnological investigation was carried out to document the effects of constructing a modern highway across a small stream in southern Ontario. During construction, suspended solids increased to as high as 1390 mg/l but later returned to pre-construction levels of less than 5 mg/l. Similarly, sediment deposition increased ten-fold to 0.61 g dry wt/cm²•day directly below the construction site during stream rechannelization after completion of the culvert. Decreased proportion of organic matter in sediments indicated that they came from the construction site. Sediments were readily removed by spates and apparently settled out in downstream ponds. There was no change in water chemistry. Standing crop of fish was reduced from 24 to 10 kg/ha immediately below the site. This decrease did not occur further downstream and fish populations at the affected site returned to orginal levels after construction. No change in numbers of riffle macroinvertebrates was observed during or after construction. However, there was a noticeable shift in species composition. Invertebrates present during construction activities may have remained in sheltered areas avoiding sedimentation effects. Evidence from invertebrate sampling in denuded areas around the site strongly suggests that organisms which may have been removed during construction were replaced quickly by drift.

77-002405 Brynildson, O. M.; Serns, S. L. EFFECTS OF DESTRATIFICATION AND AERATION OF A LAKE ON THE DISTRIBUTION OF PLANKTONIC CRUSTACEA, YELLOW PERCH, AND TROUT. Wis. Dep. Nat. Resour. Tech. Bull. No. 99. 22p. 1977. SFA 22(4)

To improve living conditions and expand the living zone for fish and their prey, dissolved-oxygen-poor Mirror Lake (5.3 ha, maximum depth 13 m) in central Wisconsin was artificially aerated during 1972-1974. After destratification (total aeration) of Mirror Lake in September 1973, trout and yellow perch and their prey, the /Daphnia/, occupied the entire lake. Before destratification of Mirror Lake, they were limited mainly to the upper half of the lake because of low dissolved oxygen levels in the lower half. Although /Daphnia/ occupied the entire lake in September 1973, they did not show an increase in average number per liter. /D. pulicaria/ doubled in average number per liter but /D. galeata/ decreased by two-thirds, leaving the total number of daphnids essentially static. In September 1974, however, /Daphnia/ showed an increase of four-fold in average number per liter after total aeration. Unlike 1973, however, /D. pulicaria/ decreased by one-half and /D. galeata/ and /D. retrocurva/ were the daphnids that increased, the latter over 10-fold. The density of calanoid and cyclopoid copepods increased during both 1973 and 1974 after total aeration, but there was no significant change in the density of the relatively small cladocerans, /Bosmina longirostris/ and /Diaphanosoma leuchtenbergianum/, after aeration. Only a small number of calanoid and cyclopoid copepods were found in the stomachs of yellow perch, while none were found in the stomachs of brook, brown, and rainbow trout from Mirror Lake even though there were as many large copepods (1 mm and larger) as there were large daphnids. Stomachs of age 1 domesticated brown and rainbow trout stocked in Mirror and Larson Lake, respectively, did not contain daphnids or copepods one week to one month after they were stocked in these lakes. Their diets were comprised mainly of terrestrial insects that were dominated in early autumn by winged ants.

77-002406 Bulkley, R. V.; Bachmann, R. W.; Carlander, K. D.; Fierstine, H. L.; King, L. R.; Menzel, B. W.; Witten, A. L.; Zimmer, D. W. WARMWATER STREAM ALTERATION IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT). U.S. Fish Wildl. Serv. FWS/OBS-76/16. v + 39p. July 1976. SFA 22(4)

[Ia. Coop. Fish. Res. Unit, Ia. State Univ., Ames 50011] This report summarizes results given in 5 other subproject reports. Studies were conducted from 1973 to 1976 to determine the extent of stream channelization in Iowa, differences in populations of fish and fish-food organisms in channelized and unchannelized streams, effects of stream alterations for highway bridge construction, and the value of stream-bank stabilization structures to fish habitat. Over 1000 miles of stream capable of supporting permanent fish populations were lost in Iowa through stream channelization. Channelization resulted in more uniform water depth and current velocity in the resulting stream with a reduction in habitat diversity. Sinuous streams had greater concentrations of drift organisms than did straightened channels. More species of fish were found in natural sections, although fish were as abundant in short-reach sections (ca. 0.5 km) channelized 10-15 years ago as in natural sections wherever brush piles and trees had accumulated in the stream. Certain structures installed in Iowa streams to protect highway bridges improved fish habitat by producing scour holes and providing cover and substrate for fish-food organisms. No additional long-reach (1.0 km) channelization should be conducted; effects of short-reach projects can be lessened by leaving as much meander in the stream as possible and by proper placing and design of bank-stabilization structures.

77-002407 Carlson, D. EPITAPH FOR LAKE OZARK PADDLEFISH. Mo. Conserv. 38 (4): 10-13. Apr. 1977. SFA 22(4)
[Mo. Dep. Conserv., Columbia]

77-002408 dodge, W. E.; Possardt, E. E.; Reed, R. J.; MacConnell, W. P. CHANNELIZATION ASSESSMENT, WHITE RIVER, VERMONT: REMOTE SENSING, BENTHOS, AND WILDLIFE. U.S. Fish Wildl. Serv. FWS/OBS-76/07. vii + 73p. June 1976. SFA 22(4)
[Mass. Coop. Wildl. Res. Unit, Univ. Mass., Amherst]

77-002409 Ferraris, C.; Wilhm, J. DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN AN ARTIFICIALLY DESTRATIFIED RESERVOIR. Hydrobiologia 54 (2): 169-176. 1 June 1977. SFA 22(4)
[Sch. Biol. Sci., Okla. State Univ., Stillwater 74074] A total of 76 taxa of benthic macroinvertebrates was collected from Ham's Lake, Oklahoma, during 1974 and 1975. The composition and density of the benthic assemblage was similar to that of other Oklahoma reservoirs. The number of species and density of macroinvertebrates decreased from March to the end of July, 1975. Species diversity and biomass did not change significantly with time. Number of species and species diversity decreased with depth on all sampling periods. The most pronounced changes occurred between 4 and 5 m during periods of thermal stratification and hypolimnion anoxia. Artificial destratification removed the thermocline from Ham's Lake with 2 wk. More gradually, the deep waters were reoxygenated. Destratification did not substantially alter the depth distribution of benthic macroinvertebrates until oxygen level of the deep water was increased.

77-002410 Giles, R. H., Jr.; Jones, A. B. III; Smart, C. W. POWER: A COMPUTER SYSTEM FOR CORRIDOR LOCATION. Va. Polytech. Inst. State Univ. Dep. Fish. Wildl. Sci. Res. Div. Bull. 117: 30p. Oct. 1976. SFA 22(4)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061]

77-002411 Haffner, G. D. SPATIAL DISTRIBUTION OF SESTON IN AN ARTIFICIALLY MIXED SYSTEM. Hydrobiologia 54 (3): 225-231. 22 June 1977. SFA 22(4)
[Lake Syst. Unit, Water Resour. Br., Ont. Minist. Environ., Toronto, ON, Canada] Seston size distribution was determined with a Coulter Counter to investigate seston interaction and its effects on phytoplankton production. Spatial distribution patterns of the non-productive component of the seston were as complex as those commonly associated with algae. Seston might interact influencing production by changes in optical depth, abrasive actions and nutrient adsorption.

77-002412 Headrick, M. R. EFFECTS OF STREAM CHANNELIZATION ON FISH POPULATIONS IN THE BUENA VISTA MARSH, PORTAGE COUNTY, WISCONSIN. U.S. Fish Wildl. Serv. FWS/OBS-76/24. vii + 38p. Sept. 1976. SFA 22(4)
[Wis. Coop. Fish. Res. Unit, Coll. Nat. Resour., Univ. Wis., Stevens Point] Fish populations from ditches 6-8 years old and 52-62 years old within the Portage County Drainage District were compared with populations in adjacent portions of natural streams. Two study areas were selected: an upstream zone of good brook trout (/Salvelinus fontinalis/) habitat and a downstream zone in marginal trout waters where white sucker (/Catostomus commersoni/) were numerous. Each area included new ditch, old ditch and natural stream, all of similar

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discharge. Estimates of annual production of brook trout, population and biomass of brook trout and white sucker, and total catch records for other fish species were derived from electrofishing samples in June, August and September, 1974 and April-May, July and September, 1975. A creel survey was conducted during the 1975 trout season. Loss of year-round instream cover through channelization limited brook trout density, which reduced annual production of brook trout to 28.8 kg/stream km in the upstream new ditch study area compared to 72.2 kg/km in the upstream old ditch and 65.5 kg/km in the upstream natural stream. Angler success was also reduced, from 1.03 trout/hr in the upstream old ditch and 1.05 trout/hr in the upstream natural stream to 0.26 trout/hr in the upstream new ditch. Midsummer water temperatures reached upper lethal levels for brook trout in the downstream ditches, where current velocity was reduced and white sucker were abundant. Mottled sculpin (/Cottus bairdi/) were consistently absent from the upstream new ditch and scarce in the downstream new ditch. The natural stream had the greatest number of fish species in both study areas (12 upstream and 18 downstream), and the new ditch had the fewest (9 upstream and 11 downstream).

77-002413 Lund, J. A. EVALUATION OF STREAM CHANNELIZATION AND MITIGATION ON THE FISHERY RESOURCES OF THE ST. REGIS RIVER, MONTANA. U.S. Fish Wildl. Serv. FWS/OBS-76/06. v + 49p. June 1976. SFA 22(4)
[Coop. Fish. Res. Unit, Mont. State Univ., Bozeman 59715] Stream morphology and gamefish populations of the St. Regis River, Montana were studied during the summers of 1973, 1974 and 1975 to determine the effects of stream channelization caused by highway (Interstate 90 and U.S. 10) and railroad construction. In-stream structures used to mitigate fish losses were also evaluated. Population estimates were made using electrofishing methods on unaltered, altered, altered with mitigating structures and "old" altered study sections. Physical parameters of each section were mapped to show differences between altered and unaltered sections. Results of the study show that mitigating structures (jetties and random rock clusters) were effective in providing fish habitat comparable to unaltered sections. Fish populations in new channels usually stabilized in approximately one year. Trout populations in "old" altered sections with no mitigation failed to recover to unaltered section levels. Due to aesthetic reasons, fishermen preferred unaltered or partially altered section over altered sections. The number of pools per section as measured by pool-riffle periodicity provided the closest correlation to trout population changes.

77-002414 Lynch, J. A.; Corbett, E. S.; Hoopes, R. IMPLICATIONS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT. Fisheries (Bull. Am. Fish. Soc.) 2 (2): 16-22. Mar.-Apr. 1977. SFA 22(4)
[Dep. Forestry Wildl., Pa. State Univ., University Park 16802]

77-002415 Overholtz, W. J.; Fast, A. W.; Tubb, R. A.; Miller, R. HYPOLIMNION OXYGENATION AND ITS EFFECTS ON THE DEPTH DISTRIBUTION OF RAINBOW TROUT (/SALMO GAIRDNERI/) AND GIZZARD SHAD (/DOROSOMA CEPEDIANUM/). Trans. Am. Fish. Soc. 106 (4): 371-375. July 1977. SFA 22(4)
[NMFS, Northeast Fish. Cent., Woods Hole, MA 02543]

77-002416 Sweeney, R.; Foley, R.; Merckel, C.; Wyeth, R. IMPACTS OF THE DEPOSITION OF DREDGED SPOILS ON LAKE ERIE SEDIMENT QUALITY AND ASSOCIATED BIOTA. J. Great Lakes Res. 1 (1): 162-170. 1975. SFA 22(4)

[Great Lakes Lab., State Univ. Coll. Buffalo, Buffalo, NY] Sediment samples were collected during June, August and November, 1973 from twenty-five (25) equally spaced stations over an area of nearly 64 sq km, the centre of which was approximately 12 km north of Cleveland, Ohio. Within this zone was a United States Corps of Engineers 16.5 sq km dump-site in which more than 18.96 x 10^6 m^3 of dredgings from Cleveland Harbor and the Cuyahoga River had been deposited between approximately 1925 and 1968. Seven (7) of the above stations were situated in this former dump-site. Simultaneously collections were made at 25 equally spaced stations in a 64 sq km area situated southwest and adjacent to the region described above. The latter area had not been used as a dump-site. The concentrations of nutrients (phosphorus and nitrogen), toxicants (heavy metals) and pollutants (as indicated by chlorine demand, BOD, COD and oils and greases measurements) in the surface sediments generally were higher in the dump-site than in the surrounding sediments. With regard to benthic macroinvertebrates, the lowest species diversity indexes and a highest oligochaete to total organism ratio generally were observed in the former spoils deposition region. It was concluded that the quality of the benthic environment was degreded by past dredging disposal practices.--From abstr.

HARVEST, CREEL CENSUS

77-002417 Clady, M. D. DISTRIBUTION AND RELATIVE EXPLOITATION OF YELLOW PERCH TAGGED ON SPAWNING GROUNDS IN ONEIDA LAKE. N.Y. Fish Game J. 24 (2): 168-177. July 1977. SFA 22(4)

[Dep. Nat. Resour., Cornell Univ., Ithaca, NY] Of 5,351 tags applied to spawning yellow perch at four sites in Oneida Lake from 1960 to 1973, 233 (4.4 per cent) were returned by anglers. The spawning run at each site consisted of perch which dispersed rapidly (within several weeks) to all parts of the lake, although a significantly greater proportion took up residence locally. The fish invariably returned to the same spawning ground in following years. The rate of tag return was positively related to size, which contributed to the greater recovery of females since they averaged larger than males among the fish tagged. Peak catches occurred in June and August. The annual survival of adult yellow eprch was estimated from the tag returns to have been 56 per cent.

77-002418 Everest, F. H. EVALUATION OF FISHERIES FOR ANADROMOUS SALMONIDS PRODUCED ON WESTERN NATIONAL FORESTS. Fisheries (Bull. Am. Fish. Soc.) 2 (2): 8-11, 34-36. Mar.-Apr. 1977. SFA 22(4)

[U.S. Forest Service, Siskiyou Natl. For., Grants Pass, OR]

77-002419 Heberlein, T. A.; Vaske, J. J. CROWDING AND VISITOR CONFLICT ON THE BOIS BRULE RIVER. Univ. Wis. Water Resour. Cent. Tech. Rep. Wis. WRC 77-04. viii + 100p. 1977. SFA 22(4)

[Dep. Rural Sociol., Univ. Wis., Madison] Nearly three thousand canoers, tubers, and fisherman were interviewed as they left the upper Bois Brule river on 24 days in the late summer of 1975. Their perceptions of crowding, satisfaction, and reported contacts with other visitors were measured. In spite of daily use levels which ranged as high as 308 visitors on a ten mile stretch there was no

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relation between use level and satisfaction (r = -.01). Use level is related to perceived crowding (r = .32, p less than .001), and feeling crowded is one aspect of overall satisfaction. (r = .14, p less than .001). This study replicates prior research by Shelby on Colorado river visitors, and casts further doubt on an econometric model of carrying capacity which is based on an assumed relationship between use level and satisfaction of river visitors. Canoers and fishermen were the most visible recreationists in terms of contacts, and tubers were the least encountered, largely due to a natural zoning which takes place on the river. All visitor groups expressed similar motivations for their visit, such as being close to nature, while differing in level of commitment, and background variables. Tubers were found to be more recent initiates to their sport and to have had less experience on other rivers than canoers and fishermen.

MARKING AND TAGGING

77-002420 Baker, J. A.; Modde, T. SUSCEPTIBILITY TO PREDATION OF BLACKTAIL SHINERS STAINED WITH BISMARCK BROWN Y. Trans. Am. Fish. Soc. 106 (4): 334-338. July 1977. SFA 22(4)
[Dep. Biol., Univ. South. Miss., Hattiesburg 39401]

77-002421 Brock, J. A.; Farrell, R. K. FREEZE AND LASER MARKING OF CHANNEL CATFISH. Prog. Fish-Cult. 39 (3): 138. July 1977. SFA 22(4)
[Coll. Vet. Med., Wash. State Univ., Pullman 99163]

77-002422 Joyce, J. a.; El-Ibiary, H. M. PERSISTENCY OF HOT BRANDS AND THEIR EFFECTS ON GROWTH AND SURVIVAL OF FINGERLING CHANNEL CATFISH. Prog. Fish-Cult. 39(3): 112-114. July 1977. SFA 22(4)
[Dep. Entomol. Fish., Univ. Ga. Coastal Plain Exp. Stn., Tifton 31794]

77-002423 Knight, A. E.; Marancik, G.; Layzer, J. B. MONITORING MOVEMENTS OF JUVENILE ANADROMOUS FISH BY RADIOTELEMETRY. Prog. Fish-Cult. 39 (3): 148-150. July 1977. SFA 22(4)
[U.S. FWS, Laconia, NH 03246]

77-002424 Stasko, A. B.; Pincock, D. G. REVIEW OF UNDERWATER BIOTELEMETRY, WITH EMPHASIS ON ULTRASONIC TECHNIQUES. J. Fish. Res. Board Can. 34 (9): 1261-1285. Sept. 1977. In English with French summ. SFA 22(4)
[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

77-002425 Walker, M. H. MEASURING AND RESTRAINING CRADLE TO FACILITATE FISH TAGGING AT SEA. Prog. Fish-Cult. 39 (3): 153-154. July 1977. SFA 22(4)
[Dep. Fish. Wildl., West. Australia Mar. Res.
Lab., North Beach, West Australia, 6020, Australia]

STOCKING AND INTRODUCTIONS

77-002426 Busch, W.-D. N.; Davies, D. H.; Nepszy, S. J. ESTABLISHMENT OF WHITE PERCH, /MORONE AMERICANA/, IN LAKE ERIE. J. Fish. Res. Board Can. 34 (7): 1039-1041. July 1977. In English with French summ. SFA 22(4)
[U.S. FWS, Sandusky, OH 44870]

77-002427 Fajen, O. F. THE ESTABLISHMENT OF SPOTTED BASS FISHERIES IN SOME NORTHERN MISSOURI STREAMS. Proc. Annu. Conf. Southeast. Assoc. Game Fish Comm. 29: 28-35. 1975[1976]. SFA 22(4)
[Fish Wildl. Res. Cent., 1110 College Ave., Columbia, MO 65201]
Spotted bass were propagated and stocked by the Missouri Department of Conservation into 16 northern and central Missouri streams to establish spotted bass fisheries. As a result of stocking more than 28,000 spotted bass fingerlings (1.2-5.5 inches in length) during the years 1961 through 1968, spotted bass fisheries were established in Lamine and Loutre rivers and Perche and Silver Fork creeks in central Missouri. Reliable reports from conservation agents indicate that fishermen catch substantial numbers of spotted bass from these streams. Spotted bass apparently did not establish populations in the Grand River, Chariton River and Salt River. Spotted bass in Sugar Creek, a tributary of Grand River near Trenton, produced at least 2 year-classes of spotted bass and at least 1 year-class of spotted bass was produced in the Mussell Fork of Chariton River, Grindstone and Big creeks in Daviess counties probably contain several year classes of spotted bass but only stocked bass were collected by electro-fishing. Spotted bass were able to reproduce and thrive in unaltered streams with stable beds as exemplified by the Lamine and Loutre rivers and Silver Fork. Large portions of the watersheds of these rivers are protected by timber, pasture or hay. The Grand and Chariton basins are intensively farmed and most of the main stem channels have been channelized. The stream beds are shifting and unstable as a result of channelization and sedimentation. Spotted bass apparently were unable to adapt to these conditions. It was recommended that tributaries of the larger rivers of north-central and north-western Missouri should be carefully considered for further black bass introductions.--From abstr.

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77-002432 Maksimov, Yu. M. CHARACTERISTIC FEATURES OF THE DEFENSIVE BEHAVIOR OF PELAGIC FISH FROM THE BOTTOM TRAWL ZONE OF THE GULF OF MEXICO. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 478-484. 1976. SFA 22(4)
[Spec. Exp. Design Bur. Fish. Ind., Klaypeda, USSR] The results of visual underwater observations on the behavior of pelagic fish in the bottom trawl zone of the gulf of Mexico are given. Methods of underwater observations by means of a towed submerged aquaplane are described. The phenomenon of the defensive behavior of fish on entering the zone fished by the trawl and also when the trawl is hauled on to the vessel is examined.

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77-002435 O'Connor, J. M.; Schaffer, S. A. THE EFFECTS OF SAMPLING GEAR ON THE SURVIVAL OF STRIPED BASS ICHTHYOPLANKTON. Chesapeake Sci. 18 (3): 312-315. Sept. 1977. SFA 22(4)
[N.Y. Univ. Med. Cent., A. J. Lanza Res. Lab., Long Meadow Rd., Sterling Forest, Tuxedo 10989] Hatchery spawned and reared eggs, yolk-sac larvae and larvae from Hudson River striped bass (/Morone saxatilis/) were released into ichthyoplankton nets in an experimental flume at velocities of 0.5, 1.5 and 3.0 fps. Percent survival was determined immediately after exposure and, for 14-day-old larvae, after 72 hr. to assess latent mortality effects. Immediate and latent mortality was found to be velocity-dependent. Yolk-sac larvae were most sensitive to velocity during net capture, followed by post-yolk-sac larvae and eggs, in decreasing order of sensitivity. Attempts to determine survival of striped bass ichthyoplankton using net-captured organisms at steam electric stations may be affected profoundly by differences in water velocity at intakes and discharges.

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[U.S. FWS, 1451 Green Rd., Ann Arbor, MI 48105] This report outlines biological problems associated with power plant intake velocities. Information needed to assess impacts of intake velocities on fishery resources and a list of technical references containing more detailed analyses of the problems and mitigation alternatives are included.

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[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Computer implemented modeling has clearly benefited managers in industrial and military management positions. Improvements in the cost effectiveness of computer use should allow fisheries and wildlife managers to make increasing use of computerized decision models. A modeling technique developed for industrial purposes to utilize the full state of knowledge of a decision problem is presented here and proposed for use in fisheries and wildlife management. The technique uses the Weibull

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function for subjective probability assignment to help solve the problem of making decisions based upon incomplete or inadequate data.

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77-002444 Krylov, V. V. UTILITY OF THE SPECIES DIVERSITY INDEX. Oceanology 16 (5): 513-514. Apr. 1977. SFA 22(4)
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[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] An outdoor recreational experience has several attributes. Keeney's methodology of multiattribute utility functions was used to discover tradeoffs between attributes and the importance of increments in each attribute for management of a small rural sport fishery. The utility function describes the preference orderings of a hypothetical decisionmaker such as a regional manager. Using the methodology, the objective function for management of a recreational stream fishery was expressed as a function of species of fish caught, average size of fish caught, average number of fish caught, and average number of anglers on the stream per day. Alternative sets of parameters for the utility function were tested in a simulation-optimization model to show sensitivities of the parameters in terms of the optimal management strategy.

LAKE MANAGEMENT & RESEARCH

77-002447 Johnson, F. H.; Osborn, T. C. EXPERIMENTAL MANAGEMENT OF A SMALL RECLAIMED LAKE IN NORTHERN MINNESOTA FOR WALLEYE, /STIZOSTEDION VITREUM VITREUM/ (MITCHELL). Minn. Dep. Nat. Resour. Sect. Fish. Invest. Rep. No. 346. 41p. 1 Apr. 1977. SFA 22(4)
[T. C. Osborn: Minn. Dep. Nat. Resour., St. Paul 55155] The intensive management of a small reclaimed lake for walleye by chemical reclamation followed by the stocking of walleyes and fathead minnows was successful in providing a productive walleye fishery. However, the failure to achieve a complete kill led to problems that could shorten the productive life of the fishery. Angling for walleye began two years after reclamation and restocking. Fishing pressure averaged 69 manhours/ha (28 manhours/acre) from 1971 through 1974. Annual walleye yield averaged 11.1 kg/ha (9.9 lbs/a) and walleyes were caught at the rate of 0.65 fish/manhour. Walleye growth was rapid and body condition was excellent for two years after reclamation but declined thereafter. The reduced growth and poorer body condition were associated with

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reduced abundance of fathead minnows, increased abundance of yellow perch, black bullheads, and northern pike and high survival of walleye fry stocked in 1971. Interspecific competition for food did not appear to be related to the slower growth and poorer body conditon. Walleye growth and body condition appeared to be density-dependent, but the cause could not be clearly identified. Predation by northern pike on walleye was probably a major cause of natural mortality. Efforts to adjust the species composition by removal of perch, pike and bullheads and by stocking more fathead minnows appeared to have little effect on walleye growth and survival. The cost-benefit ratio for intensive management of this type would range between 1:1.05 and 1:2.47 depending on the success of the reclamation and fishing pressure. Management of small reclaimed lakes for walleye is justifiable where other fishing opportunities are limited.

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[Inst. Fish. Res., Mich. Dep. Nat. Resour., Ann Arbor 48109]

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[U.S. FWS, Washington, DC 20240]

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77-002452 Binns, N. A.; Eiserman, F. M. A PREDICTIVE MODEL FOR QUANTIFICATION OF FLUVIAL TROUT HABITAT. J. Colo.-Wyo. Acad. Sci. 9 (1): 8-9. Apr. 1977. SFA 22(4)
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FARM POND AND SMALL IMPOUNDMENT MANAGEMENT

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[Dep. Fish. Wildl., Colo. State Univ., Fort Collins 80523] Abstract only.

LARGE IMPOUNDMENT MANAGEMENT & RESEARCH

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[R.I. Div. Fish Wildl., 83 Park St., Providence 02903] This publication is a summary of a survey of 101 ponds accomplished over the past 15 years.--RS

77-002455 Monkmeyer, P. L.; Hoopes, J. A.; Ho, J. C.; Clark, G. R. SELECTIVE WITHDRAWAL AND HEATED WATER DISCHARGE: INFLUENCE ON THE WATER QUALITY OF LAKES AND RESERVOIRS. PART I--SELECTIVE WITHDRAWAL. Univ. Wis. Water Resour. Cent. Tech. Rep. Wis. WRC 77-03. iv + 68p. 1977. SFA 22(4)
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77-002456 Pirozhnikov, P. L. STUDIES ON THE BIOLOGICAL PRODUCTION IN RESERVOIRS (SOME RESULTS AND PROBLEMS). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (3): 353-363. 1976. SFA 22(4)
[GosNIORKh, Leningrad, USSR] A survey is presented of the biological studies of the large reservoirs of our country. The main results of and future prospects for the study of reservoirs from the biological and bioproduction points of view are examined.

ESTUARY MANAGEMENT & RESEARCH

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[Va. Inst. Mar. Sci., Gloucester Point 23062]

MARINE MANAGEMENT & RESEARCH

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[Inst. Mar. Res., S-453 00 Lysekil, Sweden]

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77-002460 Alverson, D. L. THE 200-MILE LIMIT II: THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL. Oceanus 20 (3): 18-23. 1977. SFA 22(4)
[NMFS, Northwest Fish. Cent., Seattle, WA]

77-002461 Briggs, P. T. STATUS OF TAUTOG POPULATIONS AT ARTIFICIAL REEFS IN NEW YORK WATERS AND EFFECT OF FISHING. N.Y. Fish Game J. 24 (2): 154-167. July 1977. SFA 22(4)
[N.Y. State Dep. Environ. Conserv., Albany] Population estimates indicate that as many as 18,898 tautog were attracted to the Kismet artificial reef in Great South Bay. There, the fish averaged only 216 millimeters long, while at the Fire Island artificial reef in the Atlantic Ocean they averaged 280 millimeters. Tag returns indicate that a migration of tautog from Kismet reef began in October each year and that these fish overwintered in the inshore waters of the northwestern corner of the new York Bight. Data for mortality, growth rate and age at sexual maturity indicate that the population studied is not achieving its potential productivity. Assuming this population to be representative of that in New York waters generally, in order that females spawn at least once it would be necessary to raise the minimum size of tautog that may be taken to 9 inches (228 millimeters) and apply this size limit to both the sport and commercial fisheries.

77-002462 Jensen, A. C. NEW YORK'S MARINE FISHERIES: CHANGING NEEDS IN A CHANGING ENVIRONMENT. N.Y. Fish Game J. 24 (2): 99-128. July 1977. SFA 22(4)
[N.Y. State Dep. Environ. Conserv., Albany] Marine fisheries throughout the world have undergone tremendous changes over the past quarter-century. The situation in New York is typical. Increased pressure from foreign fishing fleets, changing domestic emphasis from commercial to recreational fishing and a changing marine environment (from natural as well as manmade causes) are producing changes in species composition in some ecosystems and in the availability and (and usability) of a number of food species. Mercury, PCB's and other pollutants have threatened the usefulness of several species. Pollution from domestic wastes has forced the closure of productive shellfish grounds. The possibility of offshore drilling for oil and gas poses a serious dilemma for coastal zone managers and fisheries managers. The increase in the number of marine anglers has put heavy pressure on several fish stocks. New management programs are suggested to bring our present fisheries programs into line with technological, social and environmental changes.

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[18920 Sound View Pl., Edmonds, WA 98020] Statistics of the Canadian and United States fishery for Pacific halibut have been refined. Catch data have been corrected and a new standard unit of fishing effort has been defined to provide for changes in hook-spacing on halibut gear. The revised catch per unit of effort and recalculated effort data more accurately reflect changes in the fishery and the resource. The data are presented by statistical area as well as by region and regulatory area and cover the period from 1929 through 1975.

77-002465 Scott, D. P. D. IMPLICATIONS OF THE THIRD UNITED NATIONS CONFERENCE ON THE LAW OF THE SEA FOR MARINE SCIENTIFIC RESEARCH. Nature 267 (5614): 762-764. 30 June 1977. SFA 22(4)
[Intergov. Oceanogr. Comm. Unesco, 7Place de Fontenoy, 75700 Paris, France]

77-002466 Sheehy, D. J.; Shenouda, S. Y. K.; Alton, A. J.; Saila, S. B.; Constantinides, S. M. THE OCEAN POUT: AN EXAMPLE OF UNDERUTILIZED FISHERIES RESOURCE DEVELOPMENT. Mar. Fish. Rev. 39 (6): 5-15. June 1977. SFA 22(4)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

MISC. TECHNIQUES AND EQUIPMENT

77-002467 Abell, P. R.; Richardson, L. B.; Burton, D. T. ELECTRONIC CONTROLLER FOR PRODUCING CYCLIC TEMPERATURES IN AQUATIC STUDIES. Prog. Fish-Cult. 39 (3): 139-141. July 1977. SFA 22(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612]

77-002468 DeFoe, D. L. TEMPERATURE SAFETY DEVICE FOR AQUATIC LABORATORY SYSTEMS. Prog. Fish-Cult. 39 (3): 131. July 1977. SFA 22(4)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd., Duluth, MN 55804]

77-002469 Jones, B. C.; Geen, G. H. MORPHOMETRIC CHANGES IN AN ELASMOBRANCH (/SQUALUS ACANTHIAS/) AFTER PRESERVATION. Can. J. Zool. 55 (6): 1060-1062. June 1977. In English with French summ. SFA 22(4)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] Length, weight, and volume of eggs, embryos, and postembryonic spiny dogfish (/Squalus acanthias/) up to 83 cm long were differentially affected when frozen or kept in 5 percent formaldehyde solutions of different salinities. Deviations from measurements in the unpreserved condition were greater with longer periods of storage and larger fish size. Morphometric changes were similar to those for teleosts at small sizes, but less at larger sizes.

77-002470 Kemmerer, A. J.; Butler, J. A. FINDING FISH WITH SATELLITES. Mar. Fish. Rev. 39 (1): 16-21. Jan. 1977. SFA 22(4)
[NMFS, Fish. Eng. Lab., Bay Saint Louis, MS 39520] The LANDSAT (Land Satellite) Investigation began in April 1975 to determine if satellites can be used to help fishermen find fish. The cooperative government, industry, and academic study uses multispectral scanners in LANDSAT satellites to measure certain ocean features for locating fishing areas for menhaden and thread herring. Two study areas were selected for field operations during the 1975 menhaden fishing season; the eastern portion of Mississippi Sound and a 5,200 km² area off the Louisiana coast. Aircraft sensors, fishing vessels, spotter pilots, research vessels, and offshore oil platforms were used to collect supplementary and corroborative data on chlorophyll, surface water temperature, salinity, color, turbidity, and fish school location and size. Data analyses so far indicate that water color and turbidity significantly correlate with the distribution of menhaden. Surface temperature and salinity do not appear to be significant factors. The

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effect of chlorophyll is unclear. Classification algorithms were developed for satellite data which divide the study areas into high and low probability fishing zones. Tests performed on these algorithms with fish catch location information indicate classification accuracies in excess of 80 percent.

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77-002472 Mitterer, L. G.; Pearson, W. D. ROSE BENGAL STAIN AS AN AID IN SORTING LARVAL FISH SAMPLES. Prog. Fish-Cult. 39 (3): 119-121. July 1977. SFA 22(4)
[Dep. Biol. Sci., North Texas State Univ., Denton 76203]

REVIEWS, BIBLIOGRAPHIES, ETC.

77-002473 Gulf South Research Institute IMPACTS OF MOSQUITO CONTROL PRACTICES. U.S. Fish Wildl. Serv. FSW/OBS-76/22. v + 97p. Apr. 1977. SFA 22(4)
[7700 GSRI Ave., Baton Rouge, LA 70808]

77-002474 Northcutt, R. G. , (Organizer) RECENT ADVANCES IN THE BIOLOGY OF SHARKS. Am. Zool. 17 (2): 287-515. 1977. SFA 22(4)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109] A collection of 16 papers.--RS

WATERSHED MANAGEMENT

77-002475 Patric, J. H.; Aubertin, G. M. LONG-TERM EFFECTS OF REPEATED LOGGING ON AN APPALACHIAN STREAM. J. For. 75 (8): 492-494. Aug. 1977. SFA 22(4)
[U.S. Forest Serv., Northeast. Forest Exp. Stn., Parsons, WV] Watershed 2 on the Fernow Experimental Forest has been logged four times since the turn of the century. While little is known of how streams were affected by logging after 1901 or during World War II, the effects of diameter-limit cutting in 1958 and 1972 are well documented. Both cuts caused small increases in streamflow but had little effect on water quality by any criterion except turbidity, which was increased by poorly located and ill-managed logging roads. The evidence suggests that if responsible road practices are followed, continued diameter-limit cutting will not harm forest streams.

WATER USE AND CONSERVATION

77-002476 Trelease, F. J. NEW WATER LEGISLATION: DRAFTING FOR DEVELOPMENT, EFFICIENT ALLOCATION AND ENVIRONMENTAL PROTECTION. Land Water Law Rev. (Univ. Wyo. Coll. Law) 12 (2): 385-429. 1977. SFA 22(4)
[Coll. Law, Univ. Wyo., Laramie]

77-002477 Wilson, W. J.; Buck, E. H.; Player, G. F.; Dreyer, L. D. WINTER WATER AVAILABILITY AND USE CONFLICTS AS RELATED TO FISH AND WILDLIFE IN ARCTIC ALASKA--A SYNTHESIS OF INFORMATION. U.S. Fish Wildl. Serv. FWS/OBS-77/06. viii + 222p. Mar. 1977. SFA 22(4)
[Arctic Environ. Inf. Data Cent., Univ. Alaska, 707 A St., Anchorage 99501]

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Parasites/Diseases - Austrobdella californiana
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Parasites/Diseases - Bacterial Diseases
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Parasites/Diseases - Bacterial Hemorrhagic Septicemia
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Parasites/Diseases - Bacterial Kidney Disease
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Parasites/Diseases - Baculovirus
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Parasites/Diseases - Bicotylophora baeri
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Parasites/Diseases - Bomolochus cuneatus
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Parasites/Diseases - Bothriocephalus
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Parasites/Diseases - Bothriocephalus gowkongensis
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Parasites/Diseases - Bouixella
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Parasites/Diseases - Bucephalidae
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Parasites/Diseases - Bucephalopsis labiatus
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Parasites/Diseases - Camallanus oxycephalus
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Parasites/Diseases - Caryophyllaeidae
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Parasites/Diseases - Ceratomyxa shasta
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Parasites/Diseases - Ciguatera
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Parasites/Diseases - Cleidodiscus ektyphus
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Parasites/Diseases - Codonophilus imbricatus
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Parasites/Diseases - Coelenterates
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Parasites/Diseases - Conispora renalis
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Parasites/Diseases - Corallotaenia minutia
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Parasites/Diseases - Crassiphiala bulboglossa
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Parasites/Diseases - Cryptobia catostomi
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Parasites/Diseases - Cymothoidae
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Parasites/Diseases - Cytophaga psychrophila
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Parasites/Diseases - Dactylogyrus atripinnei
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Parasites/Diseases - Dactylogyrus unguiformis
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Parasites/Diseases - Davisia reginae
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Parasites/Diseases - Degeneria halosauri
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Parasites/Diseases - Echinocephalus sinensis
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Parasites/Diseases - Echinorhynchus salmonis
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Parasites/Diseases - Enteric Redmouth Disease
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Parasites/Diseases - Enterobacteriaceae
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Parasites/Diseases - Ergasilus centrarchidarum
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Parasites/Diseases - Ergasilus labracis
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Parasites/Diseases - Ergasilus lizae
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Parasites/Diseases - Erythrodermatitis
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Parasites/Diseases - Eubacterium tarantellus
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Parasites/Diseases - Eubothrium salvelini
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Parasites/Diseases - Eustrongylides
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Parasites/Diseases - Fin Erosion
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Parasites/Diseases - Gas Bubble Disease
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Parasites/Diseases - Glugea stephani
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Parasites/Diseases - Grillotia erinaceus
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Parasites/Diseases - Gyrodactylus plotosi
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Parasites/Diseases - Gyrometra kunduchi
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Parasites/Diseases - Haematractidium scombri
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Parasites/Diseases - Hedruris spinigera
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Parasites/Diseases - Hemiuridae
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Parasites/Diseases - Henneguya episclera
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Parasites/Diseases - Henneguya ophiocephali
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Parasites/Diseases - Hepatomas
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Parasites/Diseases - Hepato-Renal Syndrome
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Parasites/Diseases - Holobomolochus embiotocae
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Parasites/Diseases - Hudsonia agassizi
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Parasites/Diseases - Lathyrism
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Parasites/Diseases - Lernaea cyprinacea
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Parasites/Diseases - Lernaea cyprinaceae
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Parasites/Diseases - Lernaeenicus hemirhamphi
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Parasites/Diseases - Ligula intestinalis
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Parasites/Diseases - Lymphocystis
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Parasites/Diseases - Lymphocystis Disease
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Parasites/Diseases - Macrovalvitrematoides micropogoni
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Parasites/Diseases - Malmiana
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Parasites/Diseases - Malmiana philotherma
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Parasites/Diseases - Metamicrocotyla macracantha
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Parasites/Diseases - Micropharynx parasitica
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Parasites/Diseases - Mycobacterium
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Parasites/Diseases - Myoxsoma cerebralis
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Parasites/Diseases - Myxidium
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Parasites/Diseases - Myxidium incurvatum
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Parasites/Diseases - Myxidium zealandicum
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Parasites/Diseases - Myxosoma cerebralis
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Parasites/Diseases - Myxosporida
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Parasites/Diseases - Myxosporidia
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Parasites/Diseases - Neascus
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Parasites/Diseases - Neascus rhinichthysi
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Parasites/Diseases - Neobenedenia girellae
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Parasites/Diseases - Nerocila californica
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Parasites/Diseases - Nezpercella lewisi
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Parasites/Diseases - Nitrofurazone
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Parasites/Diseases - Opecoelidae
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Parasites/Diseases - Parabothriocephalus sagitticeps
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Parasites/Diseases - Parasitic Copepods
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Parasites/Diseases - Parasitic Isopods
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Parasites/Diseases - Pasteurella
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Parasites/Diseases - Philobythos atlanticus
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Parasites/Diseases - Philometroides huronensis
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Parasites/Diseases - Phocanema decipiens
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Parasites/Diseases - Phocascaris
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Parasites/Diseases - Phyllodistomum scrippsi
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Parasites/Diseases - Phyllodistomum undulans
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Parasites/Diseases - Piscicolaria reducta
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Parasites/Diseases - Piscine Erythrocytic Necrosis
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Parasites/Diseases - Plagioporus shawi
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Parasites/Diseases - Pleistophora ovariae
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Parasites/Diseases - Plethorchis acanthus
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Parasites/Diseases - Polypodium
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Parasites/Diseases - Pomphorhynchus laevis
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Parasites/Diseases - Proteocephalus buplanensis
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Parasites/Diseases - Pseudomonas
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Parasites/Diseases - Renicola
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Parasites/Diseases - Rhabodochona kisutchi
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Parasites/Diseases - Rhinoptericola megacantha
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Parasites/Diseases - Rowardleus
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Parasites/Diseases - Salmincola edwardsii
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Parasites/Diseases - Schistocephalus solidus
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Parasites/Diseases - Spinitectus gordoni
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Parasites/Diseases - Spiruroidea
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Parasites/Diseases - Strigeoids
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Parasties/Diseases - Terranova decipiens
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Parasites/Diseases - Trachelobdella oregonensis
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Parasites/Diseases - Trypanorhyncha
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Parasites/Diseases - Trypanosoma choudhuryi
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77-002067
Toxicology - Radioactive Wastes
77-002340
Toxicology - Radionucleides
77-001696

77-002359
Toxicology - Rotenone
77-000739
Toxicology - Saponins
77-000728
Toxicology - Sediment Bioassays
77-002376
Toxicology - Selenium
77-000366
77-002346
Toxicology - Sevin
77-000736
Toxicology - Sewage Effluents
77-002341
77-002350
Toxicology - Silver
77-001669
Toxicology - Simazine
77-001706
Toxicology - Sodium Lauryl Sulfate
77-000722
Toxicology - Solvents
77-001675
Toxicology - Strontium
77-001655
77-001696
Toxicology - Surfactants
77-000728
Toxicology - TBTO
77-002349
Toxicology - TCDD
77-002385
Toxicology - TFM
77-000379
77-001668
77-001739
77-001740
77-001743
77-001744
Toxicology - Thanite
77-000763
Toxicology - Toxaphene
77-001716
77-001746
Toxicology - Toxaphene/Techniques
77-001741
Toxicology - Trace Materials/Techniques
77-001701
Toxicology - Trace Metals
77-002356
Toxicology - Treatment Plant Effluents
77-000351
Toxicology - Tritium
77-002340
Toxicology - Urea
77-000131
Toxicology - Wood Leachates
77-000371
Toxicology - Yttrium
77-001696
Toxicology - Zinc
77-000377
77-000721
77-000734
77-000738
77-001653
77-001661
77-001664
77-001705
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77-002335
Utilization of Fishery Products - Archaeological Sites
77-000795
Utilization of Fishery Products - Eviscerating Machines
77-001864
Water Use/Conservation - Land Use Effects
77-000801
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Water Use/Conservation - Water Allocations
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Water Use/Conservation - Water Law
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Water Use/Conservation - Watershed Councils
77-001878
Water Use/Conservation - Watershed Management
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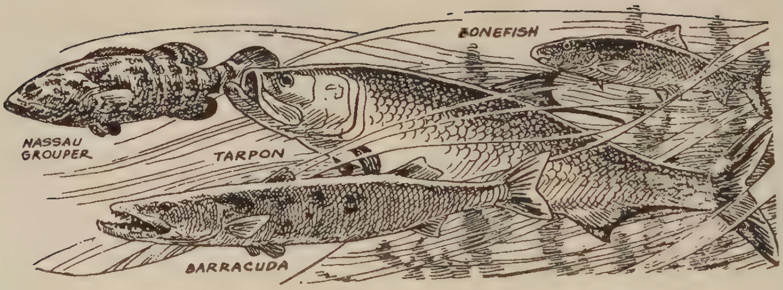
BONEFISH
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LIST OF PUBLICATIONS SCREENED

The following publications were screened for Volume 22. Abstracts not covered by this list are of irregularly published papers, are contributions of cooperating abstracters, or are of separates from publications not regularly received by the Morgan Library of Colorado State University.

Acta Agriculturae Scandinavica	Acta Agric. Scand.
Acta Hydrochemica et Hydrobiologica	Acta Hydrochim. Hydrobiol.
Acta Parasitologica Polonica	Acta Parasitol. Pol.
Acta Protozoologica	Acta Protozool.
Acta Virologica	Acta Virol. (Prague)(Engl. Ed.)
Acta Zoologica	Acta Zool. (Stockh.)
Acta Zoologica Fennica	Acta Zool. Fenn.
Alaska Department of Fish and Game Informational Leaflet	Alaska Dep. Fish Game Inf. Leafl.
Alaska Fish Tales & Game Trails	Alaska Fish Tails Game Trails
Ambio	Ambio
American Journal of Science	Am. J. Sci.
American Midland Naturalist	Am. Midl. Nat.
American Museum Novitates	Am. Mus. Novit.
American Naturalist	Am. Nat.
American Scientist	Am. Sci.
American Zoologist	Am. Zool.
Anals of Zoology (Agra)	Ann. Zool. (Agra)
Animal Behavior	Anim. Behav.
Annales de Biologie Animale Biochemie Biophysique	Ann. Biol. Anim. Biochim. Biophys.
Annales d'hydrobiologie	Ann. Hydrobiol.
Annales de L'Institut Oceanographique	Ann. Inst. Oceanogr.
Annales de Limnologie	Ann. Limnol.
Annales de Zoologie Ecologie Animale	Ann. Zool. Ecol. Anim.
Annales Zootechnie	Ann. Zootech.
Annals of the Cape Provincial Museums Natural History	Ann. Cape Prov. Mus. Nat. Hist.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Tropical Medicine and Parasitology	Ann. Trop. Med. Parasitol.
Annotationes Zoologicae Japonenses	Annot. Zool. Jpn.
Applied and Environmental Microbiology	Appl. Environ. Microbiol.
Aquaculture	Aquaculture
Archiv fur Fischereiwissenschaft	Arch. Fischereiwiss.
Archiv fur Hydrobiologie	Arch. Hydrobiol.
Archiv fur Hydrobiologie Supplementband	Arch. Hydrobiol. Supplementb.
Archiv fur Tierernaehrung	Arch. Tierernaehr.
Archives of Environmental Contamination and Toxicology	Arch. Environ. Contam. Toxicol.
Archives of Toxicology	Arch. Toxicol.
Archives de Zoologie Experimentale et Generale	Arch. Zool. Exp. Gen.
Arctic and Alpine Research	Arct. Alp. Res.
Arkansas Game and Fish	Ark. Game Fish
Arkiv for Zoologi	Ark. Zool.
Arquivos de Ciencias do Mar	Arq. Cienc. Mar.
Australian Journal of Biological Science	Aust. J. Biol. Sci.
Australian Journal of Marine and Freshwater Research	Aust. J. Mar. Freshwater Res.
Australian Journal of Zoology	Aust. J. Zool.
Australian Zoologist	Aust. Zool.
Bamidgeh	Bamidgeh
Bangladesh Journal of Scientific and Industrial Research	Bangladesh J. Sci. Ind. Res.
Behavioral Ecology and Sociobiology	Behav. Ecol. Sociobiol.
Behaviour	Behaviour
Biochemical Genetics	Biochem. Genet.
Biologia	Biologia (British)
Biological Bulletin	Biol. Bull.
Biological Conservation	Biol. Conserv.
Biological Journal of the Linnean Society	Biol. J. Linn. Soc.
Biological Reviews of the Cambridge Philosophical Society	Biol. Rev. (Camb.)

Biologist	Biologist
Biology of Reproduction	Biol. Reprod.
Bioscience	Bioscience
Boletin del Instituto Oceanografico Universidad de Oriente Cumana Venezuela	Bol. Inst. Oceanogr. Univ. Oriente Cumana
Bioteria Serie Trimestral Ciencias Naturais	Bioteria Ser. Trimest. Cienc. Nat.
Bulletin of the American Museum of Natural History	Bull. Am. Mus. Nat. Hist.
Bulletin of the British Museum (Natural History) Zoology	Bull. Brit. Mus. (Nat. Hist.) Zool.
Bulletin of Environmental Contamination and Toxicology	Bull. Environ. Contam. Toxicol.
Bulletin of the Faculty of Fisheries Hokkaido University	Bull. Fac. Fish. Hokkaido Univ.
Bulletin of the Fisheries Research Board of Canada	Bull. Fish. Res. Board Can.
Bulletin of the Iraq Natural History Museum	Bull. Iraq Nat. Hist. Mus.
Bulletin of the Japanese Society of Scientific Fisheries	Bull. Jpn. Soc. Sci. Fish.
Bulletin of Marine Science	Bull. Mar. Sci.
Bulletin of the Museum of Comparative Zoology	Bull. Mus. Comp. Zool.
Bulletin of the Southern California Academy of Science	Bull. South. Calif. Acad. Sci.
California Cooperative Oceanic Fisheries Investigations Reports	Calif. Coop. Oceanic Fish. Invest. Rep.
California Department of Fish and Game Fish Bulletins	Calif. Dep. Fish Game Fish Bull.
California Fish and Game	Calif. Fish Game
Canadian Field-Naturalist	Can. Field-Nat.
Canadian Journal of Zoology	Can. J. Zool.
Cell and Tissue Research	Cell Tissue Res.
Chesapeake Science	Chesapeake Sci.
Ciencias Marinas	Cienc. Mar.
Clinical Toxicology	Clin. Toxicol.
Coastal Zone Management Journal	Coast. Zone Manage. J. (copywrite Crane, Russak & Co. N.Y.)
Colorado Outdoors	Colo. Outdoors
Commercial Fish Farmer	Commer. Fish Farmer
Comparative Biochemistry and Physiology A Comparative Physiology	Comp. Biochem. Physiol. A Comp. Physiol.
Comparative Biochemistry and Physiology B Comparative Biochemistry	Comp. Biochem. Physiol. B Comp. Biochem.
Comparative Biochemistry and Physiology C Comparative Pharmacology	Comp. Biochem. Physiol. C Comp. Pharmacol.
Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences Naturelles	C.R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat.
Conservationist	Conservationist
Contributions in Marine Science	Contrib. Mar. Sci.
Copeia	Copeia
Critical Reviews in Environmental Control	Crit. Rev. Environ. Control
Data Report Series	Environ. Can. Fish. Mar. Serv. Data Rep. Ser.
Deep-Sea Research	Deep-Sea Res.
Delaware Conservation	Del. Conserv.
Developmental Biology	Dev. Biol.
Dissertation Abstracts International B Science and Engineering	Diss. Abstr. Int. B Sci. Eng.
Doklady Biological Sciences (English Translation of Doklady Akademie Nauk SSSR Seriya Biologiya)	Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.)
Ecological Law Quarterly	Ecol. Law Q.
Ecological Monographs	Ecol. Monogr.
Ecological Research Series	U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser.
Ecology	Ecology
Ekologia Polska	Ekol. Pol.
Environmental Affairs	Environ. Aff.
Environmental Monitoring Series	U.S. Environ. Prot. Agency Environ. Monit. Ser.
Environmental Conservation	Environ. Conserv.
Environmental Pollution	Environ. Pollut.

Environmental Research	Environ. Res.
Environmental Science and Technology	Environ. Sci. Technol.
Environmental Systems	Environ. Syst.
Evolution	Evolution
FAO Fisheries Reports	FAO Fish. Rep.
FAO Fisheries Technical Paper	FAO Fish. Tech. Pap.
Fish Disease Leaflets	U.S. Fish Wildl. Serv. Fish Dis. Leafl.
Fish Distribution Report	U.S. Fish Wildl. Serv. Fish Dist. Rep.
Fish Farming International	Fish Farming Int.
Fisheries	Fisheries (Bull. Am. Fish. Soc.)
Fishery Bulletin	NOAA Fish. Bull.
Fisheries Research Board of Canada Miscellaneous Special Publications	Fish. Res. Board Can. Misc. Spec. Publ.
Florida Scientist	Fla. Sci.
Freshwater Biology	Freshwater Biol.
General and Comparative Endocrinology	Gen. Comp. Endocrinol.
General Fisheries Council of the Mediterranean Session Report	Gen. Fish. Counc. Mediterr. Sess. Rep.
Genetics	Genetics
Heredity	Heredity
Hydrobiologia	Hydrobiologia
Hydrobiological Bulletin	Hydrobiol. Bull.
Illinois Natural History Survey Bulletin	Ill. Nat. Hist. Surv. Bull.
Indian Journal of Animal Science	Indian J. Anim. Sci.
Indian Journal of Environmental Health	Indian J. Environ. Health
Informe Tecnico	Venez. Minist. Agric. Cria Inf. Tech.
Instituto de Fomento Pesquero Serie Informes Pesqueros	Inst. Fom. Pesq. Ser. Inf. Pesq.
Instituto de Fomento Pesquero Serie Investigacion Pesquera	Inst. Fom. Pesq. Ser. Invest. Pesq.
Intergovernmental Oceanographic Commission Technical Series	Intergov. Oceanogr. Comm. Tech. Ser.
International Journal of Environmental Studies	Int. J. Environ. Stud.
International Journal of Parasitology	Int. J. Parasitol.
International Pacific Halibut Commission Technical Report	Int. Pac. Halibut Comm. Tech. Rep.
Investigations in Fish Control	U.S. Fish Wildl. Serv. Invest. Fish Control
Iowa State Journal of Research	Iowa State J. Res.
Japanese Journal of Ecology	Jpn. J. Ecol.
Japanese Journal of Genetics	Jpn. J. Genet.
Journal of the Acoustical Society of America	J. Acoust. Soc. Am.
Journal of the Alabama Academy of Sciences	J. Ala. Acad. Sci.
Journal of Animal Ecology	J. Anim. Ecol.
Journal of Animal Morphology and Physiology	J. Anim. Morphol. Physiol.
Journal of Applied Ecology	J. Appl. Ecol.
Journal of the Arizona Academy of Science	J. Ariz. Acad. Sci.
Journal of Biogeography	J. Biogeogr.
Journal of the Bombay Natural History Society	J. Bombay Nat. Hist. Soc.
Journal of the Colorado-Wyoming Academy of Sciences	J. Colo.-Wyo. Acad. Sci.
Journal of Comparative Physiology A Sensory, Neural, and Behavioral Physiology	J. Comp. Physiol. A Sens. Neural Behav. Physiol.
Journal of Comparative Physiology B Metabolic Transport Functions	J. Comp. Physiol. B Metab. Transp. Funct.
Journal of Ecology	J. Ecol.
Journal of the Elisha Mitchell Scientific Society	J. Elisha Mitchell Sci. Soc.
Journal of Environmental Science and Health A Environmental Science and Engineering	J. Environ. Sci. Health A Environ. Sci. Eng.
Journal of Environmental Science and Health B Pesticides, Food Contamination and Agricultural Wastes	J. Environ. Sci. Health B Pestic. Food Contam. Agric. Wastes
Journal of Environmental Management	J. Environ. Manage.
Journal of Environmental Quality	J. Environ. Qual.
Journal of Environmental Systems	J. Environ. Syst.
Journal of Experimental Biology	J. Exp. Biol.
Journal of Experimental Marine Biology and Ecology	J. Exp. Mar. Biol. Ecol.
Journal of Experimental Zoology	J. Exp. Zool.
Journal of Fish Biology	J. Fish Biol.
Journal of the Fisheries Research Board of Canada	J. Fish. Res. Board Can.
Journal of General Virology	J. Gen. Virol.

Journal of Great Lakes Research	J. Great Lakes Res.
Journal of Helminthology	J. Helminthol.
Journal of Ichthyology (English Translation of Voprosy Ikhtiologii)	J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)
Journal of the Marine Biological Association of the United Kingdom	J. Mar. Biol. Assoc. U.K.
Journal of Marine Research	J. Mar. Res.
Journal of Marine Science	J. Mar. Sci.
Journal of the Minnesota Academy of Science	J. Minn. Acad. Sci.
Journal of Morphology	J. Morphol.
Journal of Natural History	J. Nat. Hist.
Journal of Nematology	J. Nematol.
Journal of the Oceanographical Society of Japan	J. Oceanogr. Soc. Jpn.
Journal of Parasitology	J. Parasitol
Journal of Pathology	J. Pathol.
Journal of Protozoology	J. Protozool.
Journal of Soil and Water Conservation	J. Soil Water Conserv.
Journal of the Tennessee Academy of Science	J. Tenn. Acad. Sci.
Journal of Theoretical Biology	J. Theor. Biol.
Journal of Toxicology and Environmental Health	J. Toxicol. Environ. Health
Journal of Virology	J. Virol.
Journal of the Washington Academy of Science	J. Wash. Acad. Sci.
Journal of the Water Pollution Control Federation	J. Water Pollut. Control Fed.
Journal of Wildlife Disease	J. Wildl. Dis.
Journal of Wildlife Management	J. Wildl. Manage.
Journal of Zoology	J. Zool. (Lond.)
Libyan Journal of Science	Libyan J. Sci.
Life Sciences	Life Sci.
Limnologica	Limnologica
Limnology and Oceanography	Limnol. Oceanogr.
Marine Biology	Mar. Biol.
Marine Fisheries Review	Mar. Fish. Rev.
Marine Pollution Bulletin	Mar. Pollut. Bull.
Masters Abstracts	Masters Abstr.
Memorie dell'Istituto Italiano di Idrobiologia Dott. Marco de Marchi	Mem. Ist. Ital. Idrobiol. Dott. Marco de Marchi
Miscellaneous Special Publications	Dep. Environ. Fish. Mar. Serv. Misc. Spec. Publ.
Missouri Conservationist	Mo. Conserv.
National Parks and Conservation Magazine	Natl. Parks Conserv. Mag.
Natural History	Nat. Hist.
Nature	Nature
Nematologica	Nematologica
Netherlands Journal of Zoology	Neth. J. Zool.
New Hampshire Fish and Game Department Survey Report	N.H. Fish Game Dep. Surv. Rep.
New Mexico Academy of Science Bulletin	N.M. Acad. Sci. Bull.
New York Fish and Game Journal	N.Y. Fish Game J.
New Zealand Journal of Marine and Freshwater Research	N.Z. J. Mar. Freshwater Res.
New Zealand Journal of Science	N.Z. J. Sci.
New Zealand Ministry of Agriculture and Fisheries Fisheries Research Bulletin	N.Z. Minist. Agric. Fish. Fish. Res. Bull.
New Zealand Ministry of Agriculture and Fisheries Fisheries Technical Report	N.Z. Minist. Agric. Fish. Fish. Tech. Rep.
NOAA Technical Report NMFS Circular	NOAA Tech. Rep. NMFS Circ.
NOAA Technical Report NMFS SSRF	NOAA Tech. Rep. NMFS SSRF
Northwest Science	Northwest Sci.
Occasional Papers of the Museum of Zoology, University of Michigan	Mus. Zool. Univ. Mich. Occas. Pap.
Oceanology	Oceanology
Oceanus	Oceanus
Oecologica	Oecologica (Berl.)
Ohio Fish and Wildlife Report	Ohio Fish Wildl. Rep.
Ohio Journal of Science	Ohio J. Sci.
Oikos	Oikos
Pacific Science	Pac. Sci.
Pacific Search	Pac. Search
Parasitology	Parasitology
Pesticide Biochemistry and Physiology	Pestic. Biochem. Physiol.
Pesticide Science	Pestic. Sci.
Philippine Journal of Fisheries	Philipp. J. Fish.
Philosophical Transactions of the Royal Society London B Biological Sciences	Philos. Trans. R. Soc. Lond. B Biol. Sci.

Physiological Zoology	Physiol. Zool.
Physiology and Behavior	Physiol. Behav.
Piscator	Piscator
Proceedings of the American Society of Civil Engineer, Journal of the Environmental Engineering Division	Proc. Am. Soc. Civ. Eng. J. Environ. Eng. Div.
Proceedings of the Annual Conference of the Southeast Association of Game and Fish Commissioners	Proc. Annu. Conf. Southeast Game Fish Comm.
Proceedings of the Annual Conference of the Western Association of State Game and Fish Commissioners	Proc. Annu. Conf. West. Assoc. State Game Fish Comm.
Proceedings of the Annual Meeting World Mariculture Society	Proc. Annu. Meet. World Mariculture Soc.
Proceedings of the Arkansas Academy of Science	Proc. Ark. Acad. Sci.
Proceedings of the Biological Society of Washington	Proc. Biol. Soc. Wash.
Proceedings of the Helminthological Society of Washington	Proc. Helminthol. Soc. Wash.
Proceedings of the Indian Adademy of Science Section A	Proc. Indian Acad. Sci. Sect. A
Proceedings of the International Association of Fish and Wildlife Agencies	Proc. Int. Assoc. Fish Wildl. Agencies
Proceedings of the Iowa Academy of Science	Proc. Iowa Acad. Sci.
Proceedings of the National Academy of Science	Proc. Natl. Acad. Sci.
Proceedings of the Nebraska Academy of Sciences and Affiliated Societies	Proc. Nebr. Acad. Sci. Affil. Soc.
Proceedings of the Pennsylvania Academy of Science	Proc. Pa. Acad. Sci.
Proceedings of the Royal Society of London B Biological Sciences	Proc. R. Soc. Lond. B Biol. Sci.
Proceedings of the West Virginia Academy of Science	Proc. W. Va. Acad. Sci.
Progress in Oceanography	Prog. Oceanogr.
Progressive Fish-Culturist	Prog. Fish-Cult.
Protistologia	Protistologia
Quarterly Review of Biology	Q. Rev. Biol.
Records of the Auckland Institute and Museums	Rec. Auckl. Inst. Mus.
Report of the Institute of Freshwater Research of Drottingholm	Rep. Inst. Freshwater Res. Drottingholm
Research Report	U.S. Fish Wildl. Serv. Res. Rep.
Resource Publication	U.S. Fish Wildl. Serv. Resour. Publ.
Revista Iberica de Parasitologia	Rev. Iber. Parasitol.
Revue Suisse de Zoologie	Rev. Suisse Zool.
Revista Italianadi Piscicoltura e Ittiopatologia	Riv. It. Piscic. Ittiop.
Roczniki Nauk Rolniczych Seria H Rybactwo	Rocz. Nauk Roln. Ser. H Rybactwo
Royal Ontario Museum Life Sciences Contributions	R. Ont. Mus. Life Sci. Contrib.
Royal Ontario Museum Life Sciences Occasional Papers	R. Ont. Mus. Life Sci. Occas. Pap.
Sarsia	Sarsia
Science	Science
Scientia Sinica	Sci. Sin.
Scientific American	Sci. Am.
Scientific Reports of the Hokkaido Salmon Hatchery	Sci. Rep. Hokkaido Salmon Hatchery
Sea Frontiers	Sea Front.
South African Association for Marine Biological Research Investigational Report	S. Afr. Assoc. Mar. Biol. Res. Invest. Rep.
Southwestern Naturalist	Southwest. Nat.
Soviet Journal of Ecology (English Translation of Ekologiya)	Sov. J. Ecol. (Engl. Transl. Ekologiya)
Special Publications of the Museum Texas Tech University	Spec. Publ. Mus. Texas Tech. Univ.
Star Series (U.S. Environ. Prot. Agency)	U.S. Environ. Prot. Agency Star Ser.
Suomen Kalatalous	Suom. Kalatalous
Swiss Journal of Hydrology	Swiss J. Hydrol.
Syesis	Syesis
Systematic Zoology	Syst. Zool.
Technical Bulletin (La. Wildl. Fish. Comm.)	La. Wildl. Fish Comm. Tech. Bull.
Technical Bulletin (Wis. Dep. Nat. Resour.)	Wis. Dep. Nat. Resour. Tech. Bull.
Technical Papers	U.S. Fish Wildl. Serv. Tech. Pap.

Technical Report	Environ. Can. Fish. Mar. Serv. Tech. Rep. Ser.
Texas Journal of Science	Tex. J. Sci.
Theoretical Population Biology	Theor. Popul. Biol.
Toxicology	Toxicology
Toxicology and Applied Pharmacology	Toxicol. Appl. Pharmacol.
Toxicon	Toxicon
Transactions of the American Fisheries Society	Trans. Am. Fish. Soc.
Transactions of the American Microscopical Society	Trans. Am. Microsc. Soc.
Transactions of the Illinois State Academy of Science	Trans. Ill. State Acad. Sci.
Transactions of the Kentucky Academy of Science	Trans. Ky. Acad. Sci.
Transactions of the North American Wildlife and Natural Resources Conference	Trans. N. Amer. Wildl. Nat. Resour. Conf.
Travaux Sur Les Pecheries du Quebec	Trav. Pech. Que.
Tropical Ecology	Trop. Ecol.
Tulane Studies in Zoology and Botany	Tulane Stud. Zool. Bot.
Underwater Naturalist	Underwater Nat.
Unesco Technical Papers in Marine Science	Unesco Tech. Pap. Mar. Sci.
Victoria Fisheries and Wildlife Papers	Victoria Fish. Wildl. Pap.
Virginia Journal of Science	Va. J. Sci.
Washington Department of Fisheries Technical Report	Wash. Dep. Fish. Tech. Rep.
Wassmann Journal of Biology	Wassmann J. Biol
Water, Air, and Soil Pollution	Water Air Soil Pollut.
Water Research	Water Res.
Water Resources Bulletin	Water Resour. Bull.
Water Resources Research	Water Resour. Res.
Wisconsin Department of Natural Resources Fish Management Report	Wis. Dep. Nat. Resour. Fish. Manage. Rep.
Wisconsin Department of Natural Resources Research Report	Wis. Dep. Nat. Resour. Res. Rep.
Wyoming Wildlife	Wyo. Wildl.
Xenobiotica	Xenobiotica
Zeitschrift fuer Parasitenkunde	Z. Parasitenkd.
Zoologica Scripta	Zool. Scr.
Zoological Journal of the Linnean Society	Zool. J. Linn. Soc.
Zoologischer Anzeiger	Zool. Anz.
Zoologichesky Zhurnal	Zool. Zh.
Zoologische Verhandelingen	Zool. Verh. (Leiden)
Zoomorphologie	Zoomorphologie

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March 3, 1849

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